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PRELIMINARY DATA

OPERATION AND SERVICE INSTRUCTION
FOR
OSCILLOSCOPE
MODEL NO. 1805

THE HICKOK ELECTRICAL INSTRUMENT CO.
CLEVELAND, OHIO, U.S.A.

PART NUMBER 902-331

NOTE

This is preliminary data used for packaging with the equipment and is authorized for temporary use until official technical order handbooks become available.

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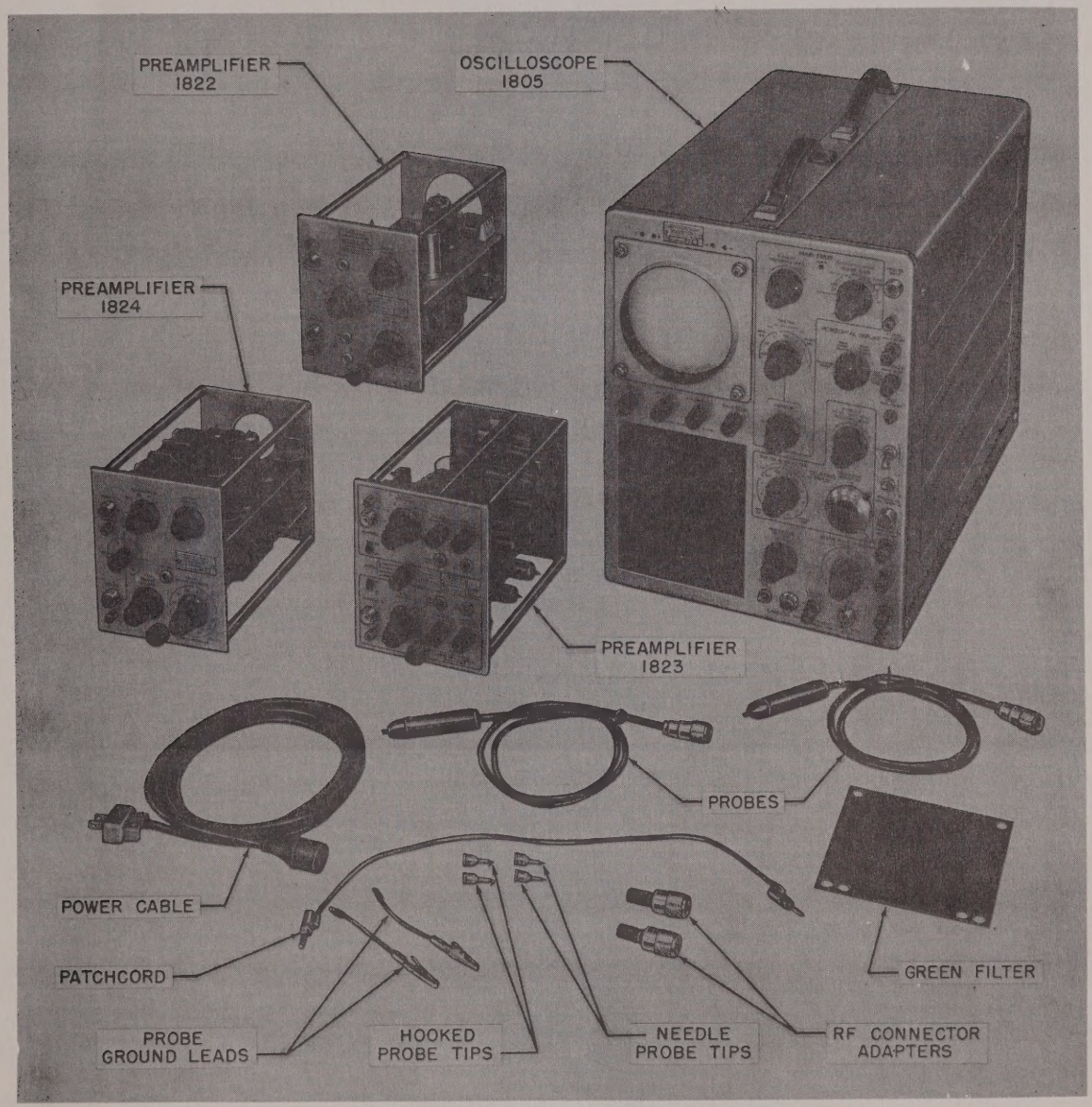


Figure 1-1. Identifying View of Oscilloscope and Associated Components

SECTION I
INTRODUCTION AND DESCRIPTION

1-1. INTRODUCTION.

1-2. GENERAL. This technical manual contains operation, service and limited repair instructions for the Oscilloscope, Model Number 1805 (FSN 7CAC-6625-553-7931). It includes procedures for making waveform observations and voltage and time measurements in a variety of operating modes. In addition, it describes the methods of trouble shooting and servicing the oscilloscope. Also explained is the function of each of the components used in conjunction with the oscilloscope. This oscilloscope is manufactured by the Hickok Electric Instrument Company of Cleveland, Ohio. See figure 1-1 for an identifying view of the oscilloscope and its associated components.

1-3. PURPOSE. Oscilloscope 1805 is a fast rise time instrument intended for general purpose use in observing complex waveforms. Accurately calibrated sweep speeds and vertical deflection sensitivity controls permit time and voltage measurements. Delayed triggered sweeps make possible the selection of small portions of the signal voltage waveform for detailed observation. An internal square wave calibrator provides a signal source for calibrating the oscilloscope (refer to paragraph 4-7) and for checking the frequency response of external equipment.

1-4. DESCRIPTION OF OSCILLOSCOPE.

1-5. GENERAL. This equipment is designed for general laboratory use. With three plug-in vertical preamplifiers it is capable of handling almost any laboratory requirement. It may be used for the study of any variable quantity which can be translated into electrical voltages by such means as a vibrator, magnetic pickup, crystal, etc. Paragraphs 1-5a through 1-5p describe the main physical and electrical characteristics.

a. The oscilloscope is constructed on a rugged aluminum framework which mounts the front and rear panels and the various electronic chassis. The chassis are arranged to permit maximum circulation of air. The components on each chassis are mounted, as far as is practicable, for accessibility in servicing.

b. All operating controls are on the front panel. Related controls are grouped together for operating convenience. Cathode-ray tube (crt) controls are grouped near the cathode-ray tube face. Sweep controls are located to the right of the crt in two outlined groups, MAIN SWEEP and DELAYING SWEEP. Each control is clearly marked. Red controls go with red lettering, black controls with black. Terminals for the oscilloscope input and output signals are located along the right side and bottom of the oscilloscope.

c. SIDE COVERS. Removable side and bottom covers provide access to the interior components. Personnel should be extremely cautious when working with the oscilloscope when its side covers are removed. For even though the high voltage chassis are protected by metal shields stenciled with appropriate warnings, serious injury could result from contact with certain high voltage elements.

d. SCALE AND FILTER. (See figure 1-2.) The face of the crt is covered by a clear plastic plate on which is printed an accurate scale graduated in centimeters. The vertical and horizontal axes are subdivided into 0.2 centimeter steps.

(1) A green filter is normally used for viewing because it provides contrast in lighted surroundings. Remove it for photography, where the brighter trace from the unfiltered screen is needed.

(2) The scale plate has two sets of holes for the scale lamps. One set of holes is clear and one is lined with red plastic so that the scale will be illuminated white or red, depending on which set of holes is placed over the lamps. Use the clear holes for normal viewing and for photography if the scale is to show up clearly. Use of red holes in photography will tone down the image of the scale and make the trace show up more clearly.

e. CATHODE RAY TUBE (crt). The oscilloscope, contains a five inch post deflection cathode-ray tube. The tube has a P2 phosphor (blue-green with a long persistence). The trace is bright enough so that a single trace can be photographed at the fastest sweep speeds.

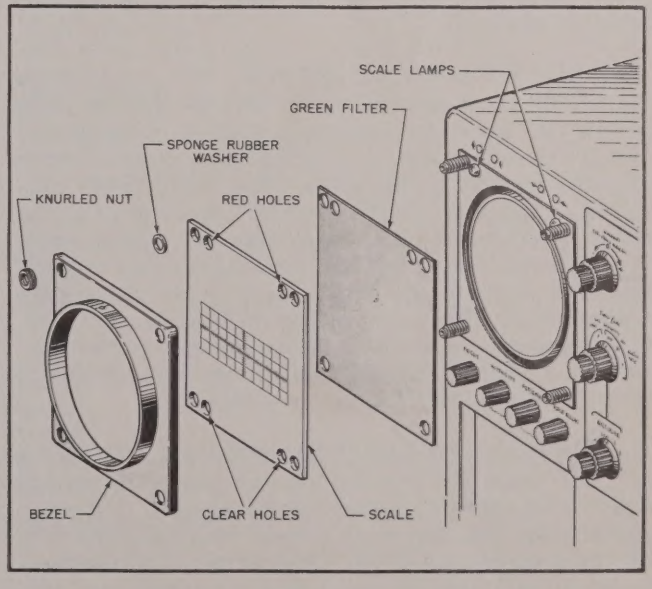


Figure 1-2. Exploded View of Scale and Filter Assembly

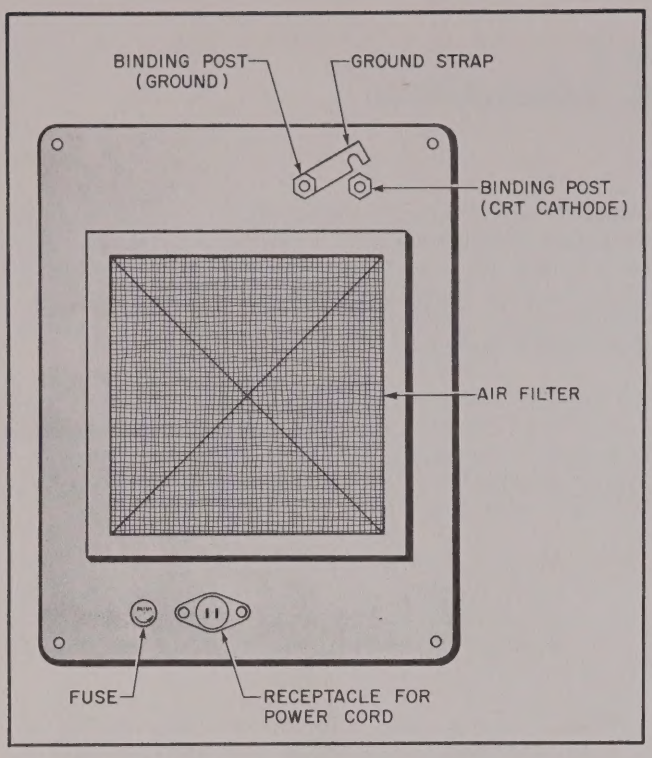


Figure 1-3. Rear View of Oscilloscope, 1805

f. REAR PANEL. The rear panel (see figure 1-3) mounts a fuse, a connection to the crt for external trace-brightness modulation and a receptacle for the power cord.

g. COOLING AIR. Filtered forced-air cooling is provided for the oscilloscope by a fan which draws air in through a replaceable air filter at the rear of the instrument. The air circulates through the oscilloscope and is then forced out through holes in the side covers. A thermal disconnect device turns off ac power in the event that the fan fails or the air intake becomes blocked.

h. SQUARE WAVE CALIBRATOR. The square wave calibrator is an accurately calibrated square wave generator. It can be used for adjusting preamplifier sensitivity so that accurate voltage measurements may be made directly on the scale. The square wave calibrator output may also be used for any external application requiring an accurately calibrated square wave. The calibrator has no internal connection to the vertical amplifier system. Its output must be fed through the probe into an input connection on the preamplifier. The calibrator consists of a symmetrical multivibrator with a cathode follower output tube whose cathode resistor is a calibrated voltage divider.

i. VERTICAL DEFLECTION SYSTEM. The main vertical amplifier is a dc coupled push-pull circuit which drives the delay line and the vertical deflection plates of the crt. Separate plug-in preamplifiers provide various sensitivities, differential amplification, channel switching for dual trace presentations, etc. The main stages of the vertical amplifier are the Input Amplifier stage (V101 and V102), the Cathode Follower stages (V103 and V104) and the six-section Distributed Amplifier output stage. Other circuits of importance are the Triggered Pickoff Amplifier (V105 and V106), the Trigger Pickoff cathode follower (V107A), the Vertical Signal Out cathode follower (V107B) and the Indicator amplifiers and lamps (V108A, DS101 and V108B, DS102, respectively).

j. DELAY LINE. The signal from the vertical amplifier is fed to the vertical deflection plates in the crt through a 1/4 microsecond delay line. The delay line retards the arrival of the waveform at the deflection plates until the crt is unblanked and the horizontal sweep started. This delay assures that the very front of fast-rise vertical signals can be observed.

k. SWEEP CIRCUITS. Two independent sweep circuits are utilized, the MAIN SWEEP and the DELAYING SWEEP. Each has its own set of front panel controls. Both sweep circuits are accurately calibrated so that the distance between two points on the trace can be converted to time with an accuracy of ±three percent.

l. MAIN SWEEP. The main sweep utilizes a Miller runup sweep generator which possesses excellent linearity with an extremely wide sweep speed range from 0.02 microseconds per centimeter to 12 seconds per centimeter, and 24 fixed sweep speeds accurate within three percent. Eight positions of the main sweep TIME/CM control initiate sweep speeds of 0.1, 1, 10, and 100 microseconds per centimeter; 1, 10, 100 milliseconds per centimeter and 1 second per centimeter. The main sweep MULTIPLIER control has three fixed positions giving multiplications of 1, 2 and 5 times to provide 24 fixed sweep speeds. Three additional positions of the MULTIPLIER control give continuously-adjustable multipliers so that the range of fixed speeds is covered continuously. The 5X magnifier increases the maximum sweep speed to 0.02 microseconds per centimeter.

(1) 5X MAGNIFIER. The 5X MAGNIFIER, mounted concentrically with the TIME/CM switch, increases the main sweep output amplifier gain five times, thereby enlarging the center two centimeter portion of the trace of ten centimeters. The HORIZONTAL POSITION control can position on the screen any one-fifth portion of the trace so magnified.

m. DELAYING SWEEP. The delaying sweep is used primarily to provide a time delay for triggering the main sweep. Like the main sweep, it utilizes a Miller runup sweep generator but with a limited sweep speed range; two microseconds per centimeter to ten milliseconds per centimeter in 12 fixed steps.

n. TRIGGERING METHODS. The main sweep can be triggered by a wide range of triggering voltages. It may be triggered internally from the signal to be displayed or from the 60 cycle line voltage. It may also be triggered externally through a front panel connector (TRIGGER INPUT). The main sweep circuit permits the sweep to be triggered from any selected point along the triggering waveform. A recurrent triggering arrangement which runs at a 50 cycle rate will synchronize with repetitive trigger signals from 60 cycles to two megacycles. The delaying sweep operates as a

triggered sweep only. This is accomplished through the TRIGGER OF NEXT SWEEP IN connector.

o. OUTPUT WAVEFORMS. The front panel connectors provide a 150 volt positive-going sawtooth and a 20 volt plug gate synchronized with the main sweep. Also provided are a 20 volt plug gate synchronized with the delaying sweep, and a 5 volt delayed trigger derived from either the main or delaying sweep. In addition a sample of the vertical deflection signal is supplied with a voltage of about two volts per centimeter of deflection. Band width of the ac coupled vertical deflection signal is six megacycles.

p. POWER SUPPLY. All dc voltages are regulated to accommodate line-voltage variations between 105 and 125 volts, or 210 and 250 volts, 50 to 60 cycles ac, and for the differences in dc loads imposed by the different plug-in units. Regulated dc is provided for some plug-in preamplifier heaters.

1-6. See figure 1-4 which tabulates the leading particulars of the oscilloscope.

CHARACTERISTIC	VALUE
Number of tubes	91
Cathode Ray Tube:	
Type	5 inch post deflection, 5BHP2
Accelerating voltage	10,000 volts.
Deflection factor, Direct connection:	
Vertical	6.5 volts per centimeter.
Horizontal	30 volts per centimeter.
Vertical Deflection:	
Basic	Dc coupled vertical amplifier; 0.01 microsecond rise time, dc to 35 mc pass band.
Preamplifier	Plug-in preamplifier determines over-all pass band and sensitivity.
Delay line	Balanced-network provides a 0.25-microsecond delay that assures start of sweep before display of vertical signal. Assures display of extreme front of fast-rising waveforms.
Horizontal Deflection System:	Two linear sweep generators with accurately calibrated sweep speeds. Built-in delay assures display of extreme front of fast vertical signals.
Main Sweep Trigger Requirements:	
Maximum input	500 volts (dc plus peak-value ac).
Minimum peak amplitude:	
External	0.2 volt.
Internal	2 millimeters of vertical deflection.
Main Sweep Generator:	
Triggering	Internal, external, or line (60 cps).
Sweep speed range	Continuously adjustable from 0.02 microsecond per centimeter to 12 seconds per centimeter, plus 24 fixed, calibrated sweep speeds in range from 0.1 microsecond per centimeter to 5 seconds per centimeter.
Calibration Accuracy	3 percent on fixed speeds.
Sweep Magnification.	Center 2-centimeter portion can be expanded to 10 centimeters (5X).

CHARACTERISTIC	VALUE
Delaying Sweep Generator:	
Triggering	External only
Sweep speed range	2 microseconds per centimeter to 10 millisecond per centimeter in 12 fixed steps.
Calibration accuracy	2 percent on fixed speeds.
Horizontal Amplifier:	
Type	Dc coupled.
Sensitivity	0.2 to 20 volts per centimeter, continuously adjustable.
Sine wave frequency response	Undistorted if product of frequency (in mc) and amplitude (in centimeters of deflection) is 2.4 or less
Calibrator:	
Voltage range	0.2 millivolts to 100 volts in 18 fixed steps.
Accuracy	3 percent.
Waveform	Square wave
Frequency	1 kc ±30 percent
Rise Time	1 microsecond
Trace Brightness Modulation (External connection):	
Impedance	8,000 to 15,000 ohms.
Discharge time constant	15 milliseconds
Output Waveforms:	
Position gate (same duration as main sweep).	+20 volts
Positive gate (same duration as delaying sweep).	+20 volts
Main sweep sawtooth waveform.	-150 volts
Delayed trigger pulse from main or delaying sweep	5 volts
Vertical signal output	Pass band 20 cycles to 6 megacycles.
60 cps Voltage	6.3 volts ac at 1 ampere.
Weight (pounds)	65
Physical Dimensions	(inches)
Height	16 3/4
Depth	24
Width	13
Power requirements (with pre-amplifier installed).	105 to 125 or 210 to 250 volts, 50 to 60 cps, 535 watts.

Figure 1-4. Table of Leading Particulars of Oscilloscope

1-7. SIMPLIFIED PRINCIPLES OF OPERATION.

1-8. GENERAL. The oscilloscope is a laboratory instrument used for analyzing electrical circuits by studying the voltage and current waveforms at different points within the circuit. It is based on the principle that an electron beam moving between two sets of deflection plates within a cathode-ray tube (crt) and then striking a phosphorescent screen can be made to appear as a stationary figure by properly adjusting the frequency of the voltages across the deflection plates.

a. The voltage waveform to be investigated is applied to the vertical deflection plates. A sawtooth (SWEEP) voltage acting as a timing wave is applied to the horizontal deflection plates. The resultant deflection of the electron beam produces a pattern on the screen which is a visible indication of the manner in which the voltage being investigated varies with respect to time.

b. The face of the crt is coated internally with a phosphor coating which glows for a time determined by the persistence of the phosphor. The trace of the electron beams across the phosphor coating will appear as a continuous curve owing to the speed at which the beam travels and to the persistence of both the phosphor coating and the human eye.

c. The face of the crt is covered externally by a transparent scale (see figure 1-2) graduated horizontally and vertically in centimeter units. This serves as a means for making voltage, time and frequency measurements (refer to paragraphs 4-38 through 4-40.) Vertical deflections represent voltage and horizontal deflections represent time. Multiplying the vertical deflection in centimeters by the setting of the VOLTS/CM switch gives readings in volts. Multiplying the horizontal deflection in centimeters by the product of the MULTIPLIER and TIME/CM controls gives readings in seconds.

d. See figure 1-5 which is a block diagram of the oscilloscope illustrating its functional parts. The following briefly describes the functions of each of the sections.

1-9. VERTICAL SECTION. The frequency range of an oscilloscope is limited by the response characteristics of its amplifiers. Therefore, to increase the operating range and the versatility of the equipment, interchangeable plug-in preamplifiers are used. (See figure 1-1.) The preamplifier helps provide the gain required to deflect the beam from top to bottom of the crt screen so that very weak test signals can be observed.

a. The VERTICAL AMPLIFIER in the oscilloscope is used to increase the signal strength to the level required at the vertical deflection plates. The TRIGGER PICKOFF AMPLIFIER takes a portion of the input signal, amplifies it through the TRIGGER PICKOFF CATHODE FOLLOWER and the TRIGGER AMPLIFIER and feeds it to the TRIGGER SHAPER circuit where it is used to trigger the sweep. An amplified portion of the vertical deflection signal is also fed to the front panel binding post (VERT SIG OUT).

b. The balanced DELAY LINE serves to delay the signal from the vertical amplifier 1/4 microsecond so that the sweep can begin before the signal is applied to the vertical deflection plates. This makes it possible to observe the extreme front of fast rise-time signals.

c. The square wave calibrator has no internal connection to the vertical amplifier. Its purpose is to produce a 1000 cycle, voltage-calibrated symmetrical square wave which is used to calibrate the oscilloscope. The output may also be connected through the CAL OUT terminal as a signal source for checking square wave response of external equipment.

1-10. HORIZONTAL SECTION. Applying a sawtooth voltage which has a constant time rate of change to the horizontal deflection plates in the crt will cause the beam to move uniformly across the face of the crt. Applying a varying voltage (the input signal) to the vertical deflection plates at the same time will then cause the electron beam to trace the waveform of the applied voltage on the phosphorescent screen. The sweep circuits which supply the timing voltage are arranged so that as soon as the beam moves across the screen it is returned to the starting point and the process repeated. This movement is called the SWEEP and the rate at which the beam moves is called the SWEEP SPEED.

1-11. SYNCHRONIZATION. A stationary pattern is obtained on the screen when the sweep speed is synchronized with the signal being investigated. If the sweep speed is not synchronized with the signal being investigated the presented waveform will not stand still. The sweep speed may also be multiples or sub-multiples of the signal frequency in which case less than or more than (respectively) one cycle will be observed. In all modes of operation, except HF SYNC recurrent, the sweep speed is sychronized with the input signal through a triggering complex. The triggering source for the main sweep differs, however, from that of the delaying sweep as described in the following paragraphs.

1-12. MAIN SWEEP NORMAL. When the HORIZONTAL DISPLAY control is in the MAIN SWEEP NORMAL position, the main sweep circuit deflects beam in the normal manner and is, therefore, the most used mode of presenting the trace.

a. MAIN SWEEP TRIGGERING. The main sweep can be run recurrently to synchronize with recurrent waveforms, it can be triggered externally, or it can be triggered internally from either the incoming signal or the line voltage.

b. Triggering can be selected to occur at any point on the triggering waveform by manipulating the TRIGGERING LEVEL and TRIGGER SLOPE switches as described in paragraph 4-21.

1-13. DELAYING SWEEP. When the HORIZONTAL DISPLAY control is in the DELAYING SWEEP position the delaying sweep receives an external trigger signal and, at a time lapse determined by the front panel controls, triggers the main sweep. The main purpose of the delaying sweep is to provide an accurate time delay for triggering the main sweep. The main sweep

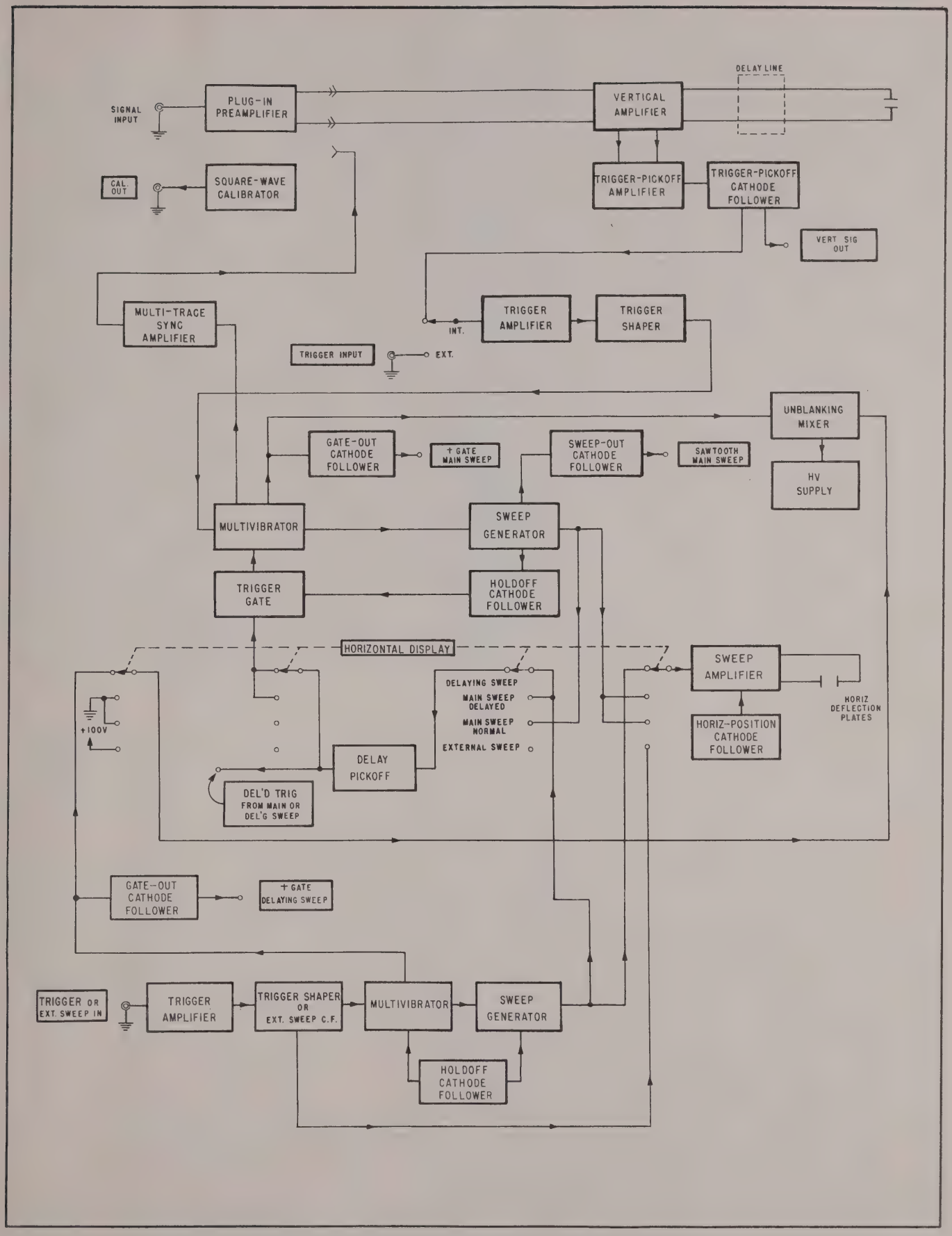


Figure 1-5. Block Diagram of Oscilloscope

then brightens the trace which is displayed by the delaying sweep. The length of the brightened portion of the trace depends upon the setting of the sweep speed controls. If the main sweep speed is faster than the delaying sweep only part of the trace is brightened. If the main sweep speed is very much faster, the brightened portion of the trace is only a spot. This spot can be used as a marker in time measurements.

a. DELAYING SWEEP TRIGGERING. The delaying sweep operates as a triggered sweep only. The source of trigger input is through the TRIGGER OR EXT SWEEP IN connector. The circuit may be triggered from the incoming vertical signal by connecting the jumper between the VERT SIG OUT connector and the TRIGGER OR EXT SWEEP IN connector. A SLOPE toggle switch is used in place of the SLOPE switch of the main sweep, otherwise triggering controls of the main and delaying sweep circuits are identical.

b. The DELAY TIME MULTIPLIER control selects a point along either the main or the delaying sweep at which the delayed trigger pulse is fed to the DELD TRIG FROM MAIN OR DELG SWEEP connector. This control is a precision ten turn dial, the setting of which is read in centimeters. This setting multiplied by the delayed sweep speed per centimeter is the time interval between the start of the delayed sweep and the start of the brightened portion of the trace. Time intervals may be measured by multiplying the difference in settings of the DELAY TIME MULTIPLIER control, corresponding to the two points on the waveform, by the settings of the TIME/CM OR DELAY TIME control. This method of computation is more accurate than a direct measurement from graduations on the scale.

c. The LENGTH CONTROL mounted concentrically on the TIME/CM OR DELAY TIME control varies the length of the trace displayed. Although it increases or decreases the duration of each sweep it does not affect the sweep speed, nor does it expand or compress the displayed waveform. It is used to make the delaying sweep revert sooner than normal and provide an increased duty cycle and more trace brightness.

1-14. MAIN SWEEP DELAYED. When the HORIZONTAL DISPLAY control is in the MAIN SWEEP DELAYED position, the input waveform must be connected to trigger the delaying sweep, which in turn triggers the main sweep after a time interval determined by the setting of the delaying sweep TIME/CM OR DELAY TIME control and the DELAY TIME MULTIPLIER control. The portion to be displayed is first selected by use of the delaying sweep as described in paragraph 1-13. The HORIZONTAL DISPLAY control is then turned to the MAIN SWEEP DELAYED position. The portion of the delaying sweep brightened by the main sweep will not be displayed across the entire screen.

a. Two triggering modes of operation are possible with main sweep delayed operation, delayed sweep and triggered delay sweep. In delayed sweep operation the main sweep controls are adjusted for recurrent operation (TRIGGER MODE Switch in AC FAST or SLOW and the STABILITY control clockwise). The delaying sweep then triggers the main sweep as previously described.

b. For triggered delayed sweep operation the TRIGGER MODE switch is placed in any position but HF SYNC. The main sweep will not start until after it is ungated by the delayed trigger from the delaying sweep. The first signal pulse thereafter will then trigger the main sweep. This method of operation is useful for displaying delayed signals without jitter even if the signal itself jitters.

1-15. When the HORIZONTAL DISPLAY switch is in EXT SWEEP position and the 5X MAGNIFIER is on, any signal connected to the TRIGGER OR EXT SWEEP IN connector will deflect the beam. There is a continuous unblanking signal with this switch setting so that the trace can be seen at all times. This mode of operation is useful when displaying Lissajour patterns.

1-16. SINGLE SWEEPS. The RESET MAIN SWEEP pushbutton can be used to initiate a single sweep or to gate the main sweep trigger circuit, depending upon the setting of the main sweep STABILITY control. Single sweeps are useful for observing a single transient. If the transient is to be observed at two points in a circuit, Preamplifier, Model No. 1823, can be used. Single sweep operation is described in paragraph 4-32.

1-17. ASSOCIATED EQUIPMENT.

1-18. The accessories included with the oscilloscope consist of the probes, RF connector adapters, the patchcord, tips, filter for face of the crt and three preamplifiers. These components are shown laid out before the oscilloscope in figure 1-1. The function of each accessory and its relationship to the oscilloscope is described in the following paragraphs.

NOTE

The three preamplifiers are identified as model numbers 1822, 1823 and 1824. They are also identified by the Hickok part number 902-334 (FSN 6625-564-9488), 902-335 (FSN 6625-593-5360 and 902-336) (FSN 6625-593-5358) respectively.

1-19. PREAMPLIFIER, MODEL NO. 1822. (See figure 1-6). This preamplifier, like each of the preamplifiers associated with this oscilloscope plugs into a compartment in the lower left side of the oscilloscope. Like its counterparts, the preamplifier is secured in place by a single captive screw. A power switch (30, figure 4-2) on the oscilloscope controls the applications of power to both units simultaneously.

CAUTION

Do not attempt to use Oscilloscope without preamplifier. Voltage regulation will be seriously altered, resulting in burned-out components and other damage.

a. This preamplifier is a wide-band, high gain, calibrated unit. Two input cables can be connected to the preamplifier at the input connections. The signal to be traced is selected with the input selector switch. If

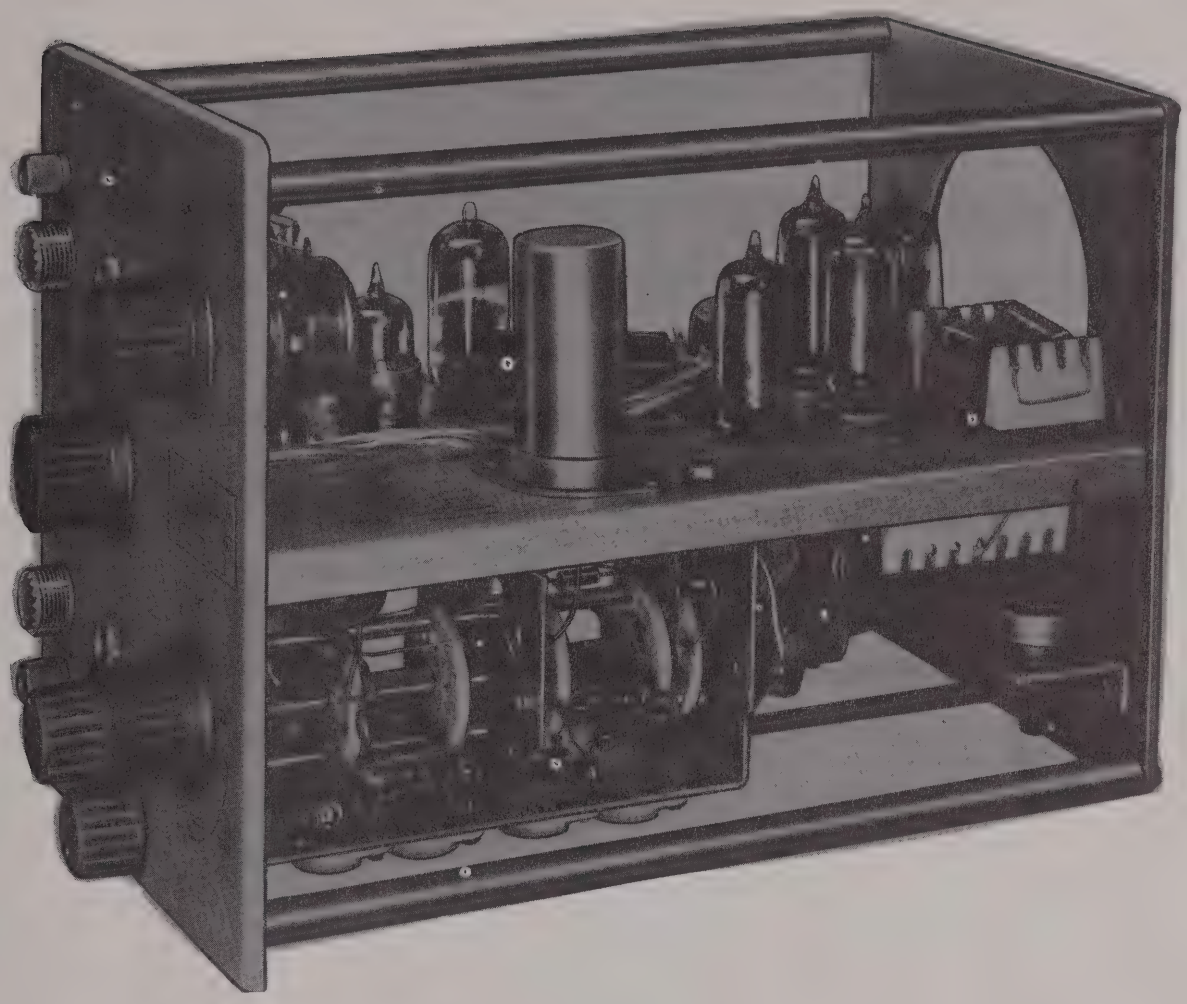


Figure 1-6. Identifying View of Preamplifier, Model No. 1822

CHARACTERISTIC	VALUE
Type	Wide band, high gain
Number of Tubes	6
Transient Response at 0.05 to 20 v/cm *	0.018
Risetime	0.01 usec
Transient Response at 0.005 to 0.02 v/cm *	
Risetime	0.03 usec
Frequency Response at 0.005 to 20 v/cm *	
Passband	dc to 20 mcs, 2 cps to 20 mcs ac
Frequency Response at 0.005 to 0.02 v/cm *	
Passband	3 cps to 12 mcs
Deflection Factor *	0.05 v/cm to 50 v/cm dc 0.005 v/cm to 50 v/cm ac
Signal Input	Two signals with more than 60 db isolation
Allowable Combined DC and Peak AC Input Voltage	600 V
Input Impedance	
Basic	1 megohm, 47 uuf
With Probe	10 megohms, 11 uuf
Weight	3-1/2 pounds

* When used with oscilloscope model no. 1805

Figure 1-7. Table of Leading Particulars of Preamplifier, Model No. 1822

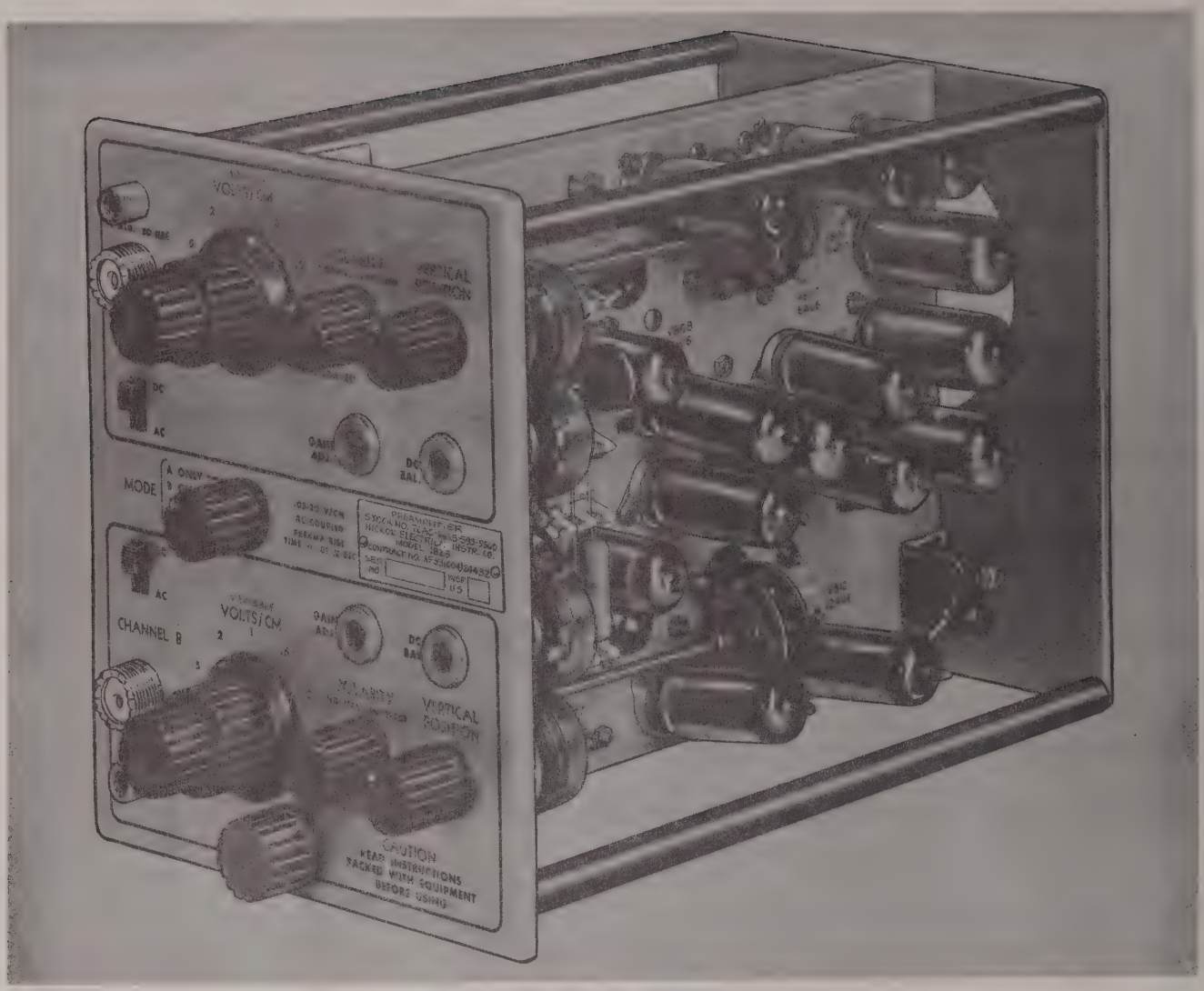


Figure 1-8. Identifying View of Preamplifier, Model No. 1823

CHARACTERISTIC	VALUE
Type	Dual channel.
Number of Tubes	15
Operating Modes	Two channels can be displayed alternately every other sweep. In free-running operation switching occurs at a rate of about 100 kcs. Either channel can be used separately.
Sensitivity *	
Basic	0.05 v/cm, ac or dc
Calibrated	0.05 to 20 v/cm in nine fixed steps.
Variable	Continuously variable from 0.05 to 50 v/cm
Passband *	DC to 24 mcs
Rise Time *	0.015 usec
Input Impedance	
Basic	1 megohm shunted by 20 uuf
With probe	10 megohms shunted by 8 uuf
Weight	4 1/2 pounds

* When used with oscilloscope model no. 1805

Figure 1-9. Table of Leading Particulars of Preamplifier, Model No. 1823

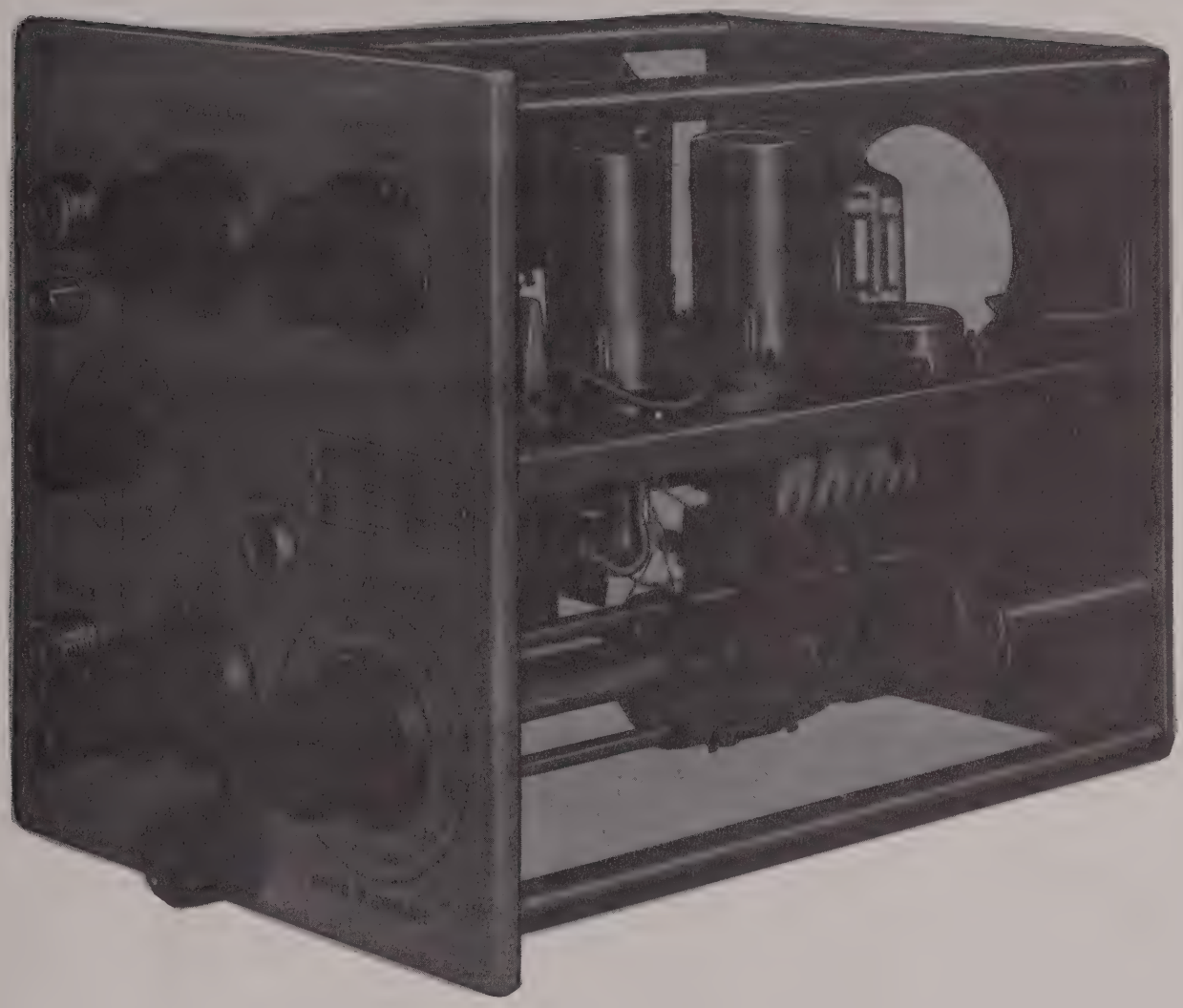


Figure 1-10. Identifying View of Preamplifier, Model No. 1824

CHARACTERISTIC	VALUE
Type	High gain, dc coupling, differential input
Number of Tubes	6
Sensitivity *	
Calibrated	1 mv/cm to 50 v/cm
Continuously Variable	1 mv/cm to 125 v/cm
Frequency Response *	
1 mv/cm	dc to 350 kcs
50 mv/cm	dc to 2 mcs
Differential Input	
DC Coupled	Rejection ratio 10,000 to 1
AC Coupled	Rejection ratio decreases with frequency (at 60 cps rejection ratio is 600 to 1)
Weight	4 pounds

* When used with oscilloscope model no. 1805

Figure 1-11. Table of Leading Particulars of Preamplifier, Model No. 1824

one signal is proportionately larger than the other, however, crosstalk may occur. The cable having the strong signal, in that event, should be disconnected. Operating instructions for this preamplifier are included in Section IV. (Refer to paragraph 4-41.)

b. This preamplifier has a maximum sensitivity of 0.05 volts per centimeter dc and 0.005 volts per centimeter ac. The circuit consists of one stage of amplification preceded and followed by cathode followers, with an additional ac coupled stage inserted in the three most sensitive positions of the VOLTS/CM switch. Refer to figure 1-7 for leading particulars of this preamplifier. Refer to figure 4-3 for a functional description of the operating controls.

1-20. PREAMPLIFIER, MODEL NO. 1823. (See figure 1-8.) This is a dual trace unit containing two separate channels and a switching circuit which feeds the output of either channel or both channels at the same time to the vertical deflection circuit of the oscilloscope.

a. When the MODE switch is in Alternate position the two channels can be displayed alternately every other sweep. In CHOPPED operation, switching occurs at a rate of about 100 kilocycles a second. A volt/centimeter control on each channel selects various sensitivity ranges so that the amplitude of the waveform on the screen may be varied to a calibrated size suitable for convenient viewing. A POLARITY switch is provided so that the pattern can be inverted. This feature is useful when it is desired to compare two 180° out-of-phase signals which are otherwise the same.

b. Either channel can be used separately without internal switching. Maximum flexibility is thus obtained within the frequency response and sensitivity limitations of the unit. Refer to figure 1-9 for leading particulars of this preamplifier and to figure 4-3 for a functional description of the operating controls. Operating instructions are included in Section IV.

1-21. PREAMPLIFIER, MODEL NO. 1824. (See figure 1-10.) Preamplifier, Model No. 1824,is a high gain differential unit designed to operate with two signals connected to the preamplifier. The signal then presented to the main vertical amplifier in the oscilloscope is the difference between the two input signals. The preamplifier can also be used conventionally to present either input signal separately. This unit is designed for work requiring dc coupling at sensitivities as high as one millivolt per centimeter and for differential input with high rejection ratio for in-phase signals. Refer to figure 1-11 for leading particulars of this preamplifier and to figure 4-3 for a functional description of the operating controls. Operating instructions are included in Section IV.

1-22. PROBES. Two co-axial cables with attached probes are provided with the oscilloscope (see figure 1-12.) The probe contains a nine megohm resistor shunted by an adjustable 3 to 12 unit capacitor which provides ten to one attenuation. The end of the probe body is threaded to receive the interchangeable hooked and needle probe tips. The RF connector is connected to the input connector (1, 17 and 19, figure 4-4) on the front panel of the preamplifier. The probe is then touched or attached to that portion of the circuit under test. The input impedance of this probe when used with Oscilloscope Model No. 1805, and preamplifier Model Nos. 1823 and 1824 is 8 uuf shunted by 10 megohms. When used with preamplifier, Model No. 1822, the input impedence is 11 uuf shunted by 10 megohms. Refer to paragraph 4-16 for use of the probe.

1-23. PATCHCORD. The patchcord is a length of insulated wire with a molded-in, banana-plug - banana-jack combination at each end. It is used for interconnecting various input and output connectors on the oscilloscope. The banana-plugs fit into the jacks provided on the universal binding posts of the oscilloscope, on the adapters when they are installed on the coaxial connectors, or on the coaxial connectors themselves. The banana-jack on each end of the patchcord may be used for connecting additional patchcords.

1-24. RD CONNECTOR ADAPTER. Each adapter is a universal binding post connected to a male coaxial connector. The latter mates with any of the coaxial connectors on the oscilloscope front panel. The installed adapter permits banana-plugs, wire leads, or spade lugs to be connected to any of the coaxial connectors.

1-25. PROBE GROUND LEADS. Ground connection is provided for the probes by the probe ground leads. These are short insulated wires with an alligator clip at one end and a terminal lug at the other. (See figure 1-12.) The lug end of the lead is connected to the probe body by a metal screw located near the cord end of the probe.

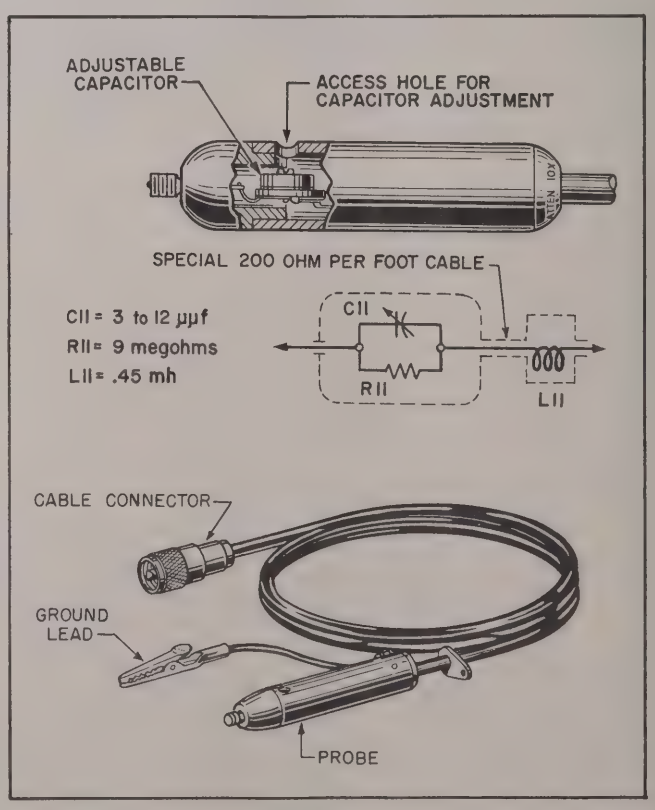


Figure 1-12. Probe With Ground Leads

SECTION II
SPECIAL SERVICE TOOLS

2-1. SPECIAL SERVICE TOOLS.

2-2. No special service tools or fixtures (other than those previously described) are required for operation and maintenance of this oscilloscope.

SECTION III
PREPARATION FOR USE, STORAGE OR SHIPMENT

3-1. PREPARATION FOR USE.

3-2. UNPACKING. Carefully unpack the oscilloscope and its minor components as described in the steps which follow. If practicable, save the packaging materials until the time when they may be reused for shipment or storage.

a. Break the seals and open the flaps on the outer waterproof carton (see figure 3-1). Remove envelopes containing Technical Manuals.

b. Open the foil bag and remove the inner carton. Remove the oscilloscope and the minor components.

c. The oscilloscope is shipped intact with all tubes and other components in place so that it may be used immediately. There is no grease or other protective coating to be removed.

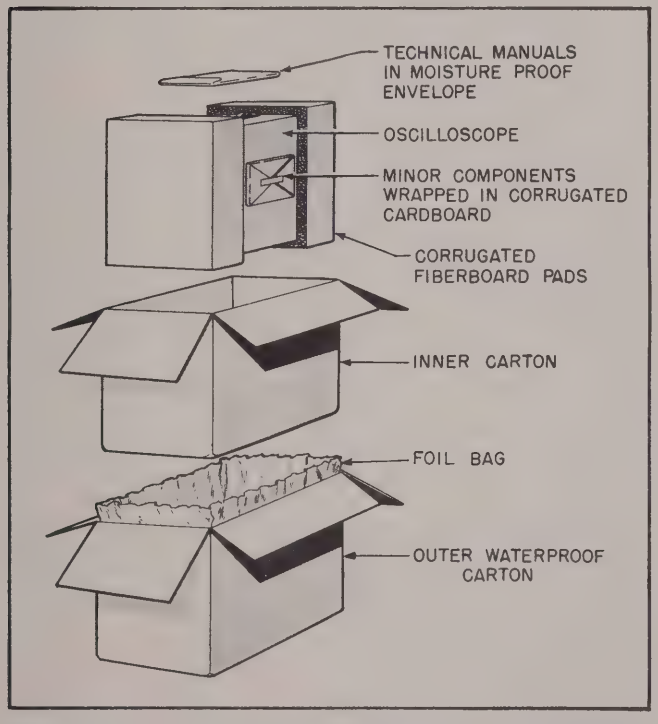


Figure 3-1. Packaging or Unpackaging Oscilloscope

3-3. INSPECTING UNPACKED OSCILLOSCOPE. Inspect the oscilloscope for damage incurred during shipment or storage. Remove side covers and examine unit for broken tubes, loose connections, broken controls and other obvious signs of damage. If equipment is damaged, repair according to the maintenance instructions, Section V, or refer unit to the appropriate Air Force Agency.

3-4. PLACEMENT OF OSCILLOSCOPE. The oscilloscope may be placed in any convenient position or attitude which permits the operator to manipulate the controls easily and accurately. The space requirements are as shown in figure 1-4, Leading Particulars. Allow at least a six inch clearance at the rear and on each side for proper ventilation.

a. Connect the female connector on the power cord to the male connector on the rear of the oscilloscope. Connect the other end of the power cord to a 105 to 125 volt, (or 210-250 volt if unit is internally connected for this voltage) 50 to 60 cycle power outlet. Power consumption is approximately 535 watts with the preamplifier installed.

WARNING

DANGEROUS VOLTAGES EXIST IN THIS OSCILLOSCOPE. The high voltages produced by this unit are dangerous and a shock produced by it may be fatal. Exercise extreme care when working on the 115 volt ac line connections. Dangerous voltages exist at the following connectors:

SAWTOOTH MAIN SWEEP	150 volts
CAL. OUT	up to 100 volts
CATHODE-RAY TUBE	8650 volts
POWER SUPPLY	500 volts

Unauthorized personnel should not remove the side covers.

3-5. STORAGE.

3-6. GENERAL. The exact procedure for repackaging depends on the material available and the conditions under which the equipment is to be stored. Use the original packaging materials if they are available. Adapt the procedures outlined below as far as circumstances permit. See figure 3-1 for a view of the original packaging.

3-7. MATERIALS. The materials listed in figure 3-2 are required for packaging the oscilloscope if the original packaging is not available.

Material	Quantity
Waterproof metal foil	30 sq. ft.
Waterproof tape	15 ft.
Cotton twine	50 ft.
Corrugated cardboard	30 sq. ft.
Gummed tape	15 ft.
Filler material	8 lb.

Figure 3-2. Table of Packaging Materials

3-8. PACKAGING. Package the oscilloscope for storage as follows:

a. Coil the power cable and probes. Secure the coils with cotton twine. Cushion the probe tips and adapters with filler material and wrap all these items, including the jumpers, in paper or corrugated cardboard secured with gummed tape. Make the package as flat as possible. Place the two instruction books in a waterproof envelope and seal with waterproof tape.

b. Cushion the front and rear of the oscilloscope with pads of corrugated cardboard as shown in figure 3-1. Sides of the pads must extend at least six inches from the front and rear of the oscilloscope. If the pads are built up of a number of sheets of cardboard, hold them together with glue, staples or tape so that the pads will stay on when the oscilloscope is boxed.

c. Place the padded oscilloscope into the carton. Place the package of miscellaneous components down one side of the carton in the space between the pads.

d. Close flaps of the inner carton and seal with waterproof tape. Wrap the inner carton in a waterproof metallic foil and seal the edges. If a new carton is used, first mash down all corners so that the metallic foil will not be torn by them.

e. Insert the foil wrapped inner carton into the outer carton, close the flaps and seal with waterproof tape.

3-9. SHIPMENT.

3-10. If the oscilloscope is to be shipped, it shall be packaged as described in paragraphs 3-6 through 3-8. Special instructions or precautions relative to protective packing or handling, including shipping forms, manifests, etc., should be referred to the transportation officer in charge.

CAUTION

Rough or unnecessary handling may seriously damage the oscilloscope.

SECTION IV
OPERATION INSTRUCTIONS

4-1. FRONT PANEL CONTROLS OF OSCILLOSCOPE.

4-2. The operator should understand the function of each of the operating controls and know where each is before attempting to operate the oscilloscope. Refer to figure 4-1 which lists each control and describes its function. Locate position of each control on the oscilloscope by referring to figure 4-2.

Control, Indicator, or Connector	Fig. 4-2 Index No.	Function
POWER switch	30	Turns on power.
FOCUS control	37	Adjusts sharpness of trace on *crt screen.
INTENSITY control	38	Regulates brightness of trace displayed on crt screen.
ASTIGMATISM control	39	Adjusts shape of spot on crt screen; adjusted together with FOCUS control for sharpest trace.
SCALE ILLUM. control	40	Dimmer for scale lamps.
Beam position indicators	1	Arrow next to glowing lamp indicates direction trace is deflected off screen.
MAIN SWEEP CONTROLS		
TRIGGERING LEVEL control (black outer knob)	4	Selects point on triggering waveform at which triggering occurs.
STABILITY control (red inner knob)	5	Controls stability of main sweep. The PRESET position (control turned full ccw and beyond detent) is suitable for most triggering applications. In the full cw position the main sweep free-runs, in the center position the main sweep can be triggered, and in full ccw position the main sweep is inoperative.
READY lamp	6	Lights when the RESET MAIN SWEEP pushbutton is pressed. When the READY light is lit, a single trigger coupled into the TRIGGER INPUT connector will trigger a single sweep.
RESET MAIN SWEEP pushbutton	14	Actuates main sweep to accept trigger for single-sweep display. READY lamp glows when circuit is ready to accept trigger.
TRIGGERING MODE selector switch (red inner knob)	8	Five-position switch. Selects the following triggering circuits: HF SYNC: Synchronized mode. Sweep runs recurrently and will synchronize with signal frequencies up to 30 mc. AUTOMATIC: Synchronized mode. Sweep has repetition rate of 50 cps and locks in with recurrent waveforms from about 60 cycles to about 2 mcs. AC FAST: Triggered mode. This position prevents 60 cps and other low frequencies from triggering sweep. AC SLOW: Triggered mode. This position eliminates the dc component of triggering waveform. Suitable for signals from 2 cps to 5 mcs or 10 mcs. DC: Triggered mode. Direct coupling extends response to dc.
TRIGGER SLOPE selector switch (black outer knob)	7	Selects trigger source: EXT: External trigger coupled through TRIGGER INPUT connector.

*crt - Cathode Ray Tube

Figure 4-1. Table of Front Panel Controls and Terminals of Oscilloscope (Sheet 1 of 3)

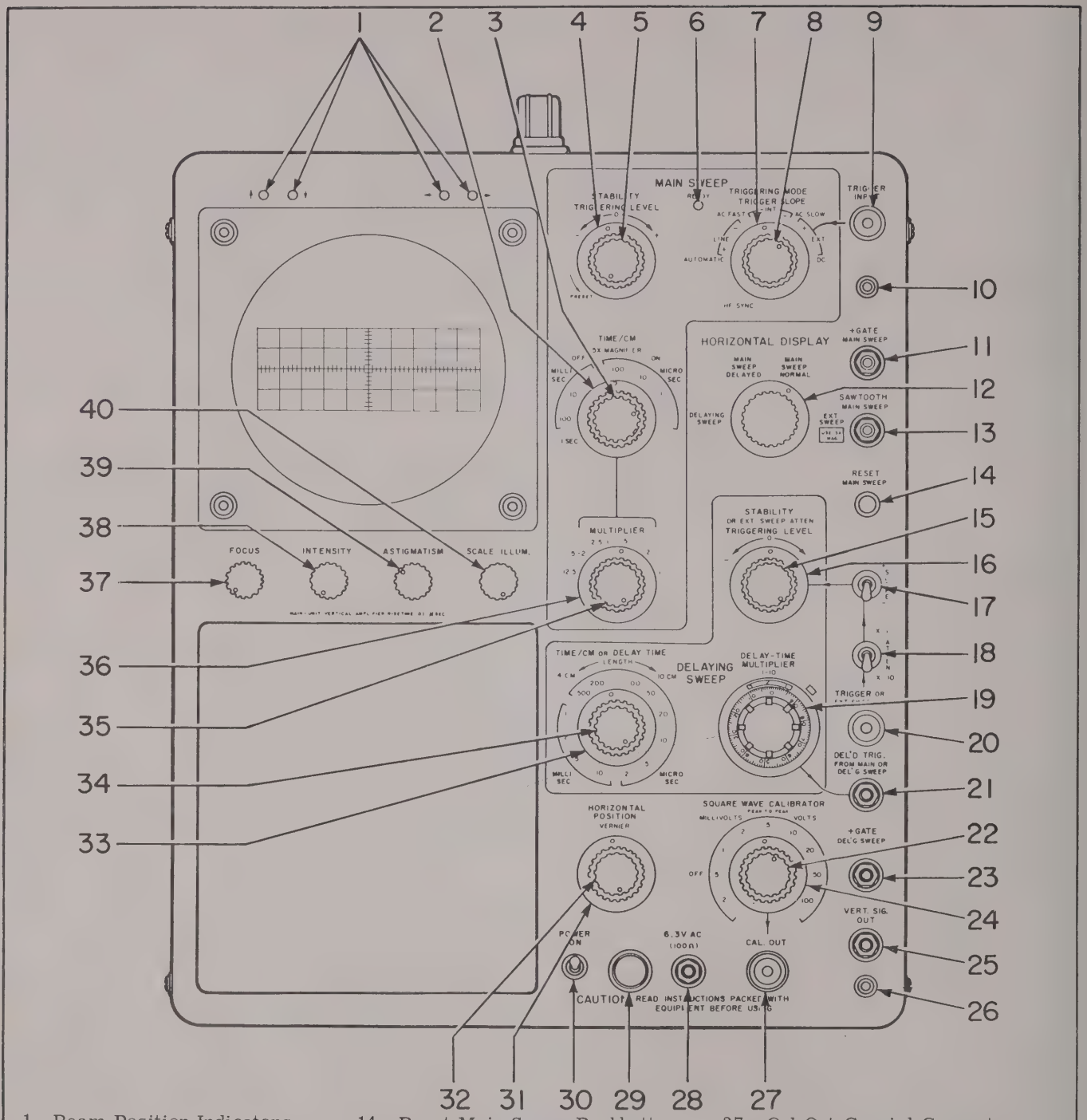
Control, Indicator, or Connector	Fig. 4-2 Index No.	Function
TRIGGER SLOPE selector switch (black outer knob) (Continued)	7	INT: Internal trigger (sample of vertical signal). LINE: Internal 60-cycle ac supply. Each source has a plus (+) and minus (-) position: Plus (+) Trigger occurs on positive-going portion of waveform. Minus (-) Trigger occurs on negative-going portion of waveform.
TIME/CM selector switch (black outer knob)	2	Selects main sweep speed together with MULTIPLIER control. Provides sweep (time per centimeter) of 0.1, 1, 10, 100 MICROSEC (microseconds); 1, 10, 100 MILLISEC (milliseconds); and 1 SEC.
5X MAGNIFIER switch (red inner knob)	3	In ON position, expands centertwo cm portion of trace to full-screen width of 10 cm.
MULTIPLIER selector switch (black outer knob) and variable multiplier control (red inner knob)	36	The black knob together with the TIME/CM control selects sweep speed. Product of MULTIPLIER and TIME/CM control settings is time required for the sweep to move one cm. The MULTIPLIER has fixed multipliers (black figures) of 1, 2, and 5 and three variable positions of 2.5-1, 5-2, and 12-5. The red center knob provides a continuous adjustment of three variable positions.
HORIZONTAL DISPLAY selector switch	12	Selects operating mode of sweep circuits: DELAYING SWEEP: Delaying sweep circuit displays trace. Main sweep brightens delay sweep trace while it runs. MAIN SWEEP DELAYED: Main sweep displays trace. Delaying sweep sets time delay between trigger and start of main sweep.
HORIZONTAL DISPLAY selector switch (Continued)	12	MAIN SWEEP NORMAL: Only main sweep displayed. It can be triggered internally by the displayed signal or by a signal applied to the upper TRIGGER INPUT connector. EXT. SWEEP: Signal applied to TRIGGER OR EXT. SWEEP IN binding post will cause horizontal deflection. 5X MAGNIFIER must be ON when external sweep is used.
DELAYING SWEEP CONTROLS		
TIME/CM OR DELAY TIME selector switch (black outer knob)	33	Selects delaying sweep speed. Provides sweep speeds (time per centimeters) of 2, 5, 10, 20, 50, 100, 200, 500 MICROSEC and 1, 2, 5, 10 MILLISEC in fixed steps.
LENGTH control (red inner knob)	34	Adjusts horizontal length of delaying sweep between 4 cm and 10 cm. Normally left at 10 cm (full scale). This control is used to make the sweep revert immediately after the delayed main sweep is triggered. This increases the possible duty cycle and gives increased trace intensity at high sweep speeds.
DELAY-TIME MULTIPLIER control (10 turn precision dial)	19	Adjusts timing of delayed trigger output of delaying sweep. Product of DELAY-TIME MULTIPLIER and TIME/CM OR DELAY TIME settings is trigger delay.
STABILITY OR EXT SWEEP ATTEN control (red inner knob)	15	With HORIZONTAL DISPLAY selector switch in DELAYING SWEEP or MAIN SWEEP DELAYED positions, it controls stability of delay sweep circuit. With HORIZONTAL DISPLAY selector

Figure 4-1. Table of Front Panel Controls and Terminals of Oscilloscope (Sheet 2 of 3)

Control, Indicator or Connector	Fig. 4-2 Index No.	Function
STABILITY OR EXT SWEEP ATTEN control (red inner knob) (Continued)	15	switch in EXT SWEEP, this control provides horizontal attenuation.
TRIGGERING LEVEL control (black outer knob)	16	Same function as MAIN SWEEP TRIGGERING LEVEL control, but applied to delaying sweep.
SLOPE toggle switch	17	Plus (+) Position: Triggering pulse occurs on positive-going portion of triggering waveform. Minus (-) Position: Triggering pulse occurs on negative-going portion of triggering waveform.
ATTEN toggle switch	18	Attenuates signal coupled to TRIGGER OR EXT. SWEEP IN connector. Used mainly for external sweep inputs. X 1 position: No Attenuation. X 10 position: Attenuates input signal 10 times.
HORIZONTAL POSITION control (black inner knob)	31	Positions trace horizontally.
VERNIER control (red inner knob)	32	Provides fine adjustment for HORIZONTAL POSITION control.
SQUARE WAVE CALIBRATOR selector switch (black outer knob)	24	Selects square wave calibrator peak-to-peak outputs of 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100 (volts or millivolts), depending on calibrator range switch settings.
Calibrator range switch (red inner knob)	22	Selects voltage range of calibrator outputs read on SQUARE WAVE CALIBRATOR dial. OFF: Calibrator turned off. MILLIVOLTS: Range is 0.2 to 100 millivolts. VOLTS: Range is 0.2 to 100 volts.

Control, Indicator or Connector	Fig. 4-2 Index No.	Function
TRIGGER INPUT coaxial connector	9	Connects external trigger to main sweep.
Ground binding post	10	Chassis ground connection.
+GATE MAIN SWEEP binding post	11	Provides 20-volt positive pulse synchronized with main sweep. Same duration as sweep.
SAWTOOTH MAIN SWEEP binding post	13	Provides 150-volt positive-going sawtooth synchronized with main sweep.
TRIGGER OR EXT SWEEP IN coaxial connector	20	Connects external trigger for delaying sweep or external sweep for horizontal amplifier, depending on setting of HORIZONTAL DISPLAY selector switch.
DEL'D TRIG FROM MAIN OR DEL'G SWEEP	21	Supplies delayed trigger from main sweep or from delaying sweep.
Plus (+) GATE DEL'G SWEEP binding post	23	Provides 20-volt positive pulse synchronized with delaying sweep. Same duration as sweep.
VERT. SIG. OUT binding post	25	Provides 2 v/cm sample of vertical signal with bandwidth of 20 cps to 6 mcs.
Ground binding post	26	Chassis ground connection.
CAL. OUT coaxial connector	27	Output connection for square wave calibrator.
6.3 V AC binding post CRT CATHODE binding post (on rear of oscilloscope)	28	Source of 6.3 volts at 60 cps. Connection to crt cathode for external trace brightness (Z axis) modulation.
GROUND binding post (on rear of oscilloscope)		Ground connection for external trace brightness modulation. Normally strapped to CRT CATHODE binding post.

Figure 4-1. Table of Front Panel Controls and Terminals of Oscilloscope (Sheet 3 of 3)



1. Beam Position Indicators
2. Time/CM Switch
3. 5X Magnifier Switch
4. Triggering Level Control
5. Stability Control
6. Ready Lamp
7. Trigger Slope Switch
8. Triggering Mode Switch
9. Trigger Input Connector
10. Ground Binding Post
11. +Gate Main Sweep
12. Horizontal Display Switch
13. Sawtooth Main Sweep Binding Post
14. Reset Main Sweep Pushbutton
15. Stability or Ext Sweep Atten Control
16. Triggering Level Control
17. Slope Toggle Switch
18. Atten Toggle Switch
19. Delay-Time Multiplier Control
20. Trigger or Ext Sweep In
21. Delayed Trigger Connector
22. Calibrator Range Switch
23. +Gate Del'g Sweep Binding Post
24. Square Wave Calibrator Switch
25. Vert Sig Out Binding Post
26. Ground Binding Post
27. Cal Out Coaxial Connector
28. 6.3 V AC Binding Post
29. Indicator Lamp
30. Power Switch
31. Horizontal Position Control
32. Vernier Control
33. Time/CM or Delay-Time Switch
34. Length Control
35. Variable Multiplier Control
36. Multiplier Switch
37. Focus Control
38. Intensity Control
39. Astigmatism Control
40. Scale Illum Control

Figure 4-2. Front Panel Controls and Terminals of Oscilloscope

4-3. FRONT PANEL CONTROLS OF PREAMPLIFIERS.

4-4. Associated with the oscilloscope are three plug-in type preamplifiers. (Refer to paragraphs 1-19 through 1-21.) The function of each of the front panel controls for the preamplifiers is described in figure 4-3. Locate position of each control on preamplifier by referring to figure 4-4.

Control, Indicator or Connector	Fig. 4-4 Index No.	Function
Preamplifier, Model No. 1822		
INPUT A, INPUT B	1	Separate UHF coax connectors to preamplifier by way of INPUT SELECTOR switch.
DC BAL	2	Adjusts amplifier balance so that trace does not shift as VARIABLE control is rotated.
VERTICAL POSITION	3	Positions trace vertically.
VOLTS/CM switch	4	Selects vertical deflection sensitivities.
VARIABLE (red inner knob)	5	Varies gain over range of 2 1/2 to 1
GAIN ADJ 1	6	Screwdriver control, sets basic gain of dc amplifier.
GAIN ADJ 2	7	Screwdriver control, sets gain of ac amplifier to 10.
INPUT SELECTOR switch	8	Selects either of two inputs and type in-input coupling.
Preamplifier, Model No. 1823		**
VOLTS/CM selector switch (black outer knob)	9	Selects accurately calibrated vertical deflection sensitivities of 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, or 20 volts per centimeter when VARIABLE control is in CALIBRATED position.
VARIABLE control (red inner knob)	10	Provides uncalibrated variable vertical deflection sensitivities between settings of the VOLTS/CM selector switch (up to 50 volts/cm for switch setting of 20) when turned counterclockwise from the CALIBRATED position.
POLARITY switch	11	Selects polarity of displayed waveform: NORMAL: Displayed waveform has same polarity as input signal. INVERTED: Displayed waveform is inverted 180 degrees (positive-going signal displayed as negative going).
VERTICAL POSITION control	12	Shifts trace up or down on screen. Each channel is controlled independently.
GAIN ADJ. control	13	Screwdriver adjustment for setting calibrated vertical deflection sensitivity.
DC BAL	14	Screwdriver adjustment for setting amplifier balance so that trace does not shift vertically as VARIABLE control is turned.
MODE selector switch	15	Controls distribution of signals from pre-amplifier to oscilloscope vertical deflection system. A ONLY: Only the channel A signal is displayed. B ONLY: Only the channel B signal is displayed. CHOPPED: Both signals are displayed. Switching from one channel to the other is at arbitrary rate (about 100 kc). This mode of operation is used when a single transient is to be observed at two points in a circuit, and also for slow sweeps when the alternate mode has too much flicker. ALTERNATE: Both signals are displayed, each channel on alternate sweeps.

**Since the operating controls for channels A and B are identical, the function of the controls for only one channel is described.

Figure 4-3. Table of Front Panel Controls and Terminals of Preamplifiers (Sheet 1 of 2)

Control, Indicator or Connector	Fig. 4-4 Index No.	Function
AC-DC switch	16	Provides ac or dc coupled input. Low-frequency response is 2 cycles per second for AC position.
CHANNEL A coaxial	17	Couples input signal to preamplifier channel A.
Ground binding post	18	Chassis ground connection.
Preamplifier, Model No. 1824		
INPUT A, INPUT B	19	Separate signal inputs by way of INPUT SELECTOR switch.
MILLIVOLTS/CM	20	Inserts attenuators between signal inputs and the amplifier.
VERTICAL POSITION	21	Moves the trace vertically.
DIFF BAL	22	Sets differential bias on input tubes to provide a fine differential adjustment of input stage gain, so that max. in phase rejection can be obtained.
DIFF BAL (Continued)	22	
MV/CM MULTIPLIER	23	Changes gain and provides 15 calibrated sensitivities in conjunction with the MILLIVOLTS/CM switch.
VARIABLE (red inner knob)	24	Provides variable attenuation between calibrated sensitivities and decreases sensitivity to 125 v/cm.
FINE (red inner knob)	25	Provides a fine adjustment of dc balance on input-amplifier plates.
PREAMP BALANCE	26	Balances dc voltages on input plates cascade amplifier, such that rotation of VARIABLE gives no trace shift.
INPUT SELECTOR switch	27	Provides choice of either input separately or the two inputs differentially with either ac or dc coupling.

Figure 4-3. Table of Front Panel Controls and Terminals of Preamplifiers (Sheet 2 of 2)

4-5. STARTING PROCEDURE.

4-6. Select the preamplifier according to the dictates of the test and insert it into the oscilloscope.

a. Set the front panel controls as follows:

INTENSITY	Ccw
FOCUS	Center
ASTIGMATISM	Center
HORIZONTAL DISPLAY	MAIN SWEEP NORMAL
MAIN SWEEP controls:	
TRIGGERING LEVEL	Ccw
STABILITY	PRESET
TRIGGER SLOPE	+ INT
TRIGGERING MODE	AUTOMATIC
TIME/CM	100 MICRO SEC
5X MAGNIFIER	OFF
MULTIPLIER	2
DELAYING SWEEP controls:	
TRIGGERING LEVEL	Center
STABILITY OR EXT. SWEEP	Ccw
HORIZONTAL POSITION	Center
SQUARE WAVE CALIBRATOR	5
Calibrator range switch	VOLTS

b. Turn the POWER switch to ON. The pilot lamp should glow and the fan should operate.

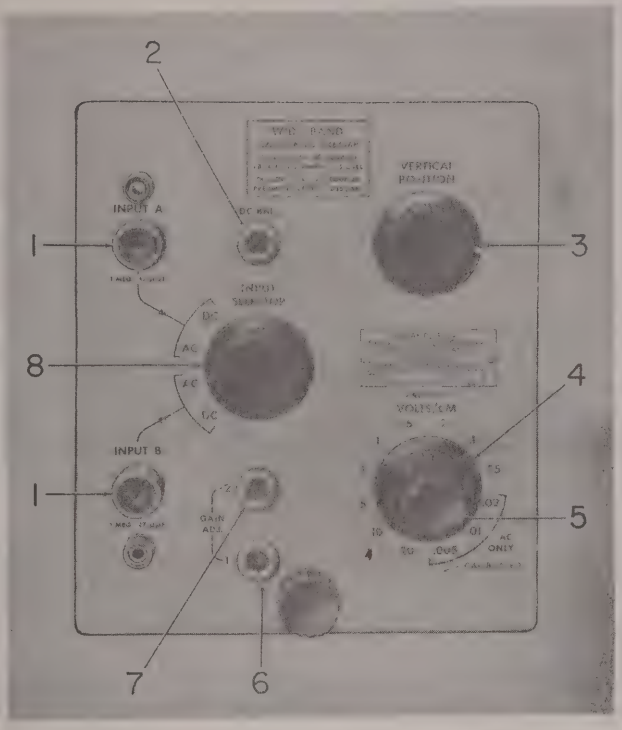
c. After about one minute, turn the INTENSITY control clockwise.

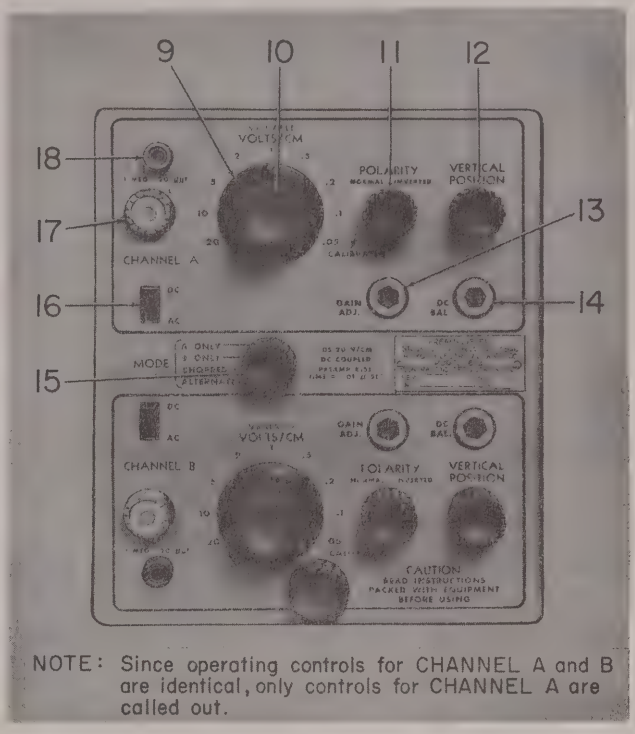
CAUTION

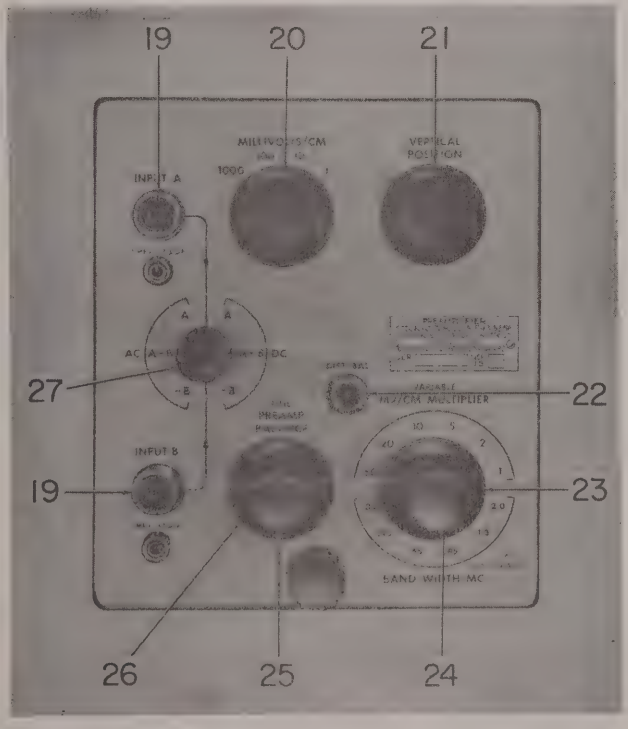
The trace can damage the cathode-ray tube screen if the INTENSITY control is advanced too far on slow-moving sweeps or if the trace is allowed to contract to a spot. Start with the INTENSITY control fully counterclockwise and advance it only as far as required for comfortable viewing. Leave the trace dim or turned off if the oscilloscope is to be left unattended.

d. A horizontal trace should appear on the screen If it does not appear, check the beam position indicators above the screen. If one or more of these lamps is glowing, the trace is off screen in the direction indicated by the arrow adjacent to the lighted lamp.

e. Use the VERTICAL POSITION and HORIZONTAL POSITION controls to position the trace on the screen.







1. Input A, Input B Connectors
2. DC Balance Control
3. Vertical Position Control
4. Volts/CM Switch
5. Variable Control
6. Gain Adjustment, number 1
7. Gain Adjustment, number 2
8. Input Selector Switch
9. Volts/CM Selector Switch
10. Variable Control
11. Polarity Switch
12. Vertical Position Control
13. Gain Adjustment
14. DC Balance Control
15. Mode Selector Switch
16. AC-DC Selector Switch
17. Channel A Connector
18. Ground Post
19. Input A and B Connectors
20. Millivolts/CM Switch
21. Vertical Position Control
22. Differential Balance Control
23. MV/CM Multiplier Switch
24. Variable Control
25. Fine Adjustment Control
26. Preamplifier Balance Control
27. Input Selector Switch

Figure 4-4. Front Panel Controls and Terminals of Preamplifiers

f. Adjust FOCUS, ASTIGMATISM, and INTENSITY controls for a sharp trace. These adjustments are somewhat interdependent; therefore, it may be necessary to readjust the FOCUS and ASTIGMATISM controls as the INTENSITY setting is changed.

g. Calibrate the preamplifier and adjust probe as described in paragraphs 4-7 through 4-14.

4-7. PRELIMINARY ADJUSTMENTS, CALIBRATION.

4-8. If the oscilloscope is being used for the first time or if it has not been used for an extended period of time, perform the adjustments listed below. If oscilloscope fails to respond as described, refer to Section VII.

NOTE

Capitalized titles correspond to markings adjacent to each control.

4-9. PROBE COMPENSATION.

a. Insert appropriate preamplifier in oscilloscope.

b. Set front panel controls as follows:

POWER switch (30, figure 4-2)	ON
Calibrator range switch (22)	VOLTS
TRIGGERING MODE Switch (8)	AUTOMATIC
SQUARE WAVE CALIBRATOR (24)	20
TIME/CM switch (2)	1 MS/CM
MULTIPLIER switch (36)	1
VOLTS/CM switch (model nos. 1822, 1823)	1
MILLIVOLTS/CM switch (model no. 1824)	1000
MODE switch (15, figure 4-4) (model no. 1823)	A ONLY or B ONLY

c. Connect probe to vertical input connector on the preamplifier and touch probe tip to calibrator output connector on the oscilloscope. Several cycles of the calibrator waveform will be displayed.

d. Note shape of square wave. If it is not flat on top and bottom, use an insulated screwdriver to adjust capacitor within probe body (see figure 1-12).

NOTE

Probe compensation is a function of the input capacitance of the preamplifier. If the compensation is incorrect frequency response will be affected.

4-10. GAIN ADJUSTMENT. (For preamplifier Model No. 1822; see figure 4-4.) Check gain adjustment as follows:

a. Perform steps outlined for probe compensation except use a direct connection from calibrator to input jack (paragraph 4-9c). Display a calibrator waveform of 0.2 volts, peak to peak, with the VOLTS/CM switch (4, figure 4-4) in the 0.05 position.

b. Adjust GAIN ADJ 1 control (6) until waveform is four centimeters high. VARIABLE control (5) must be turned to CALIBRATED position.

c. Set calibrator at 20 MILLIVOLTS and turn VOLTS/CM switch to 0.005. Adjust the GAIN ADJ 2 (7) until waveform is also four centimeters high.

4-11. DC BALANCE ADJUSTMENT. (For preamplifier, Model No. 1822; see figure 4-4.)

a. Adjust DC BALL control when trace shifts as the VARIABLE control is rotated. This adjustment shall be made after the GAIN ADJ control is set. Proceed as follows:

b. Rotate VARIABLE control (5, figure 4-4) back and forth and adjust DC BAL control (2) until trace position is no longer effected by rotation of VARIABLE control.

4-12. DC BALANCE ADJUSTMENT. (For preamplifier, Model No. 1823; see figure 4-4.)

a. Perform steps outlined for probe compensation (paragraph 4-9). Remove probe and display a horizontal trace.

b. Turn MODE selector switch (15) to ALTERNATE.

c. Adjust channel A and B VERTICAL POSITION controls (12) to display two horizontal traces.

d. Turn channel A VARIABLE control. If trace shifts, rock VARIABLE control while adjusting DC BAL control for a stationary trace.

e. Repeat steps (c) and (d) for channel B.

4-13. GAIN ADJUSTMENT. (For preamplifier, Model No. 1823; see figure 4-4.)

a. Set front panel controls as follows:

(1) SQUARE WAVE CALIBRATOR (24, figure 4-2) on oscilloscope to .2.

(2) Calibrator range switch (22) to VOLTS.

(3) VOLTS/CM switch (9, figure 4-4)(channel A) to 0.05.

(4) VARIABLE control (10) to CALIBRATED.

b. Connect patchcord from CAL OUT connector on oscilloscope to channel A input connector.

c. Adjust VERTICAL POSITION control (12) until top or bottom of waveform coincides with any horizontal line on scale.

d. If waveform is not exactly four centimeters high, turn GAIN ADJ control with small screwdriver until height of waveform is exactly four centimeters.

e. Repeat procedure for gain adjustment with channel B.

4-14. DIFFERENTIAL BALANCE ADJUSTMENT. (For preamplifier, Model No. 1824; see figure 4-4.)

a. Connect a 10 volt signal from the oscilloscope calibrator to both INPUT A and INPUT B (19).

b. Turn the INPUT SELECTOR switch (27) to A-B, DC.

c. Set the MILLIVOLTS/CM switch (20) to 1 and the MV/CM MULTIPLIER (23) to 1.

d. Adjust the DIFF BAL control (22) for minimum deflection while keeping the trace centered with the PREAMP BALANCE control (26). If the adjustment is difficult to accomplish it is helpful to start with the MV/CM MULTIPLIER (23) at 10 or 20.

e. If the DIFF BAL control cannot be adjusted as described, it may indicate that V1102 and V1101 are faulty. Try interchanging these tubes. If balance cannot then be obtained, the tubes should be replaced.

4-15. OPERATING MODES AND USE OF CONTROLS AND ACCESSORIES.

4-16. USE OF PROBE. Set up the probe for use as follows:

a. Attach the probe ground lead to the probe body with the metal screw located near the cord end of the probe (see figure 1-12).

NOTE

Before using the probe, always check its adjustment as described in paragraph 4-9.

b. Connect the probe cable to the desired input connector on the preamplifier.

c. Either the needle tip or the hooked tip may be screwed onto the threaded stud on the end of the probe. Use the needle tip for most purposes when the probe need not be left in place. The hooked tip can be hooked around a terminal or lead and the probe can usually be placed so that it will support itself.

d. Be careful in choosing the measuring point. Although the oscilloscope has a high input impedance, the source response may suffer if the probe is connected to a high impedance source. If possible, measure at the cathode of a stage rather than at the grid or plate. The use of the probe increases the input impedance of the oscilloscope from one to ten megohms while decreasing the input capacitance.

WARNING

Hold probe well back of tip to avoid shock.

e. When making amplitude measurements with an attenuator probe, be sure to multiply the observed amplitude by the attenuation of the probe marked in white on the probe body (see figure 1-12).

CAUTION

Know the approximate value of the signal source before connecting it to the oscilloscope. Do not exceed the following voltage limitations (vols dc plus maximum volts ac).

Preamplifier INPUT connectors	600v
Main Sweep TRIGGER INPUT	600v
Delaying Sweep TRIGGER or EXTERNAL SWEEP IN	500v
CRT CATHODE (on rear of oscilloscope)	600v

4-17. MAIN SWEEP HIGH FREQUENCE RECURRENT OPERATION.

NOTE

This mode of operation is most reliable for signals from 10 mcs to 30 mcs, although it may work on signals as low as 5 mcs. If a signal between 5 mcs to 10 mcs cannot be displaced in this mode, or if it can be displayed but the trace jitters badly, use one of the triggered methods.

a. Start the oscilloscope as described in paragraph 4-5.

b. Connect the probe (or probes) to the signal source.

c. Set up the preamplifier controls for the type of operation desired.

d. Set the TRIGGERING MODE switch to HF SYNC.

e. Turn the main sweep STABILITY control clockwise until a trace is displayed.

f. Adjust the TIME/CM and TRIGGER SLOPE controls for the best display.

g. Adjust the STABILITY control for the most stable trace.

4-18. GENERAL TRIGGERING INSTRUCTIONS.

4-19. TRIGGERED OPERATION. Triggered operation is more versatile than recurrent operation and should be used for the following conditions:

a. It is difficult to obtain a stable trace in recurrent operation.

b. Only a selected portion of the waveform is to be observed.

4-20. TRIGGERING SOURCES FOR MAIN SWEEP. Three sources of trigger pulses for the main sweep can be selected with the TRIGGER SLOPE switch: LINE (60 cps), INT (a sample of the vertical signal), and EXT (any signal connected to the TRIGGER INPUT connector). Each of these has a + and a - position which determines whether triggering occurs on rising or on falling portions of the triggering waveform.

a. LINE. Use the LINE position for observing signals which recur at a 60 cps rate, or at a multiple of 60 cps.

b. INT. Use the INT position if the signal itself is a suitable trigger. In dual-trace operation (with preamplifier, Model No. 1823) internal triggering occurs only when the MODE switch is in the ALTERNATE position. With the switch in the CHOPPED position, the sweep will be triggered by the shift from one trace to the other such that EXT trigger should be used.

c. EXT. Use external triggering when a source external to the oscilloscope is to be used. To use external triggering, connect trigger source to the TRIGGER INPUT connector and turn TRIGGER SLOPE switch to EXT, + or -.

4-21. USE OF MAIN SWEEP EXTERNAL TRIGGERING. Use external triggering in main sweep operation under the following conditions:

a. To synchronize the display with a signal not under observation occuring in the equipment under test.

NOTE

If the INTERNAL mode does not provide good synchronization, an auxiliary signal in the equipment under test may provide better synchronization.

b. To compare the phase difference or time lag between two signals, use either of the signals as the trigger source. (For direct comparison of phase difference both signals may be displayed in dual trace operation with preamplifier, Model No.1823.)

c. To synchronize the display in chopped dual-trace presentation (with preamplifier, Model No. 1823) when the display cannot be synchronized internally.

4-22. TRIGGERING MODES FOR MAIN SWEEP. Three triggered modes of operation for the main sweep may be selected by the TRIGGERING MODE switch:

a. AC FAST. Use this position if the triggering waveform has a 60 cps hum which causes erratic triggering.

b. AC SLOW. Use this position if the triggering waveform has an undesirable dc component.

c. DC. Use this position if the triggering waveform changes slowly and evenly at less than two cps, as when triggering at a certain voltage level, rather than on a pulse.

4-23. TRIGGER SLOPE AND TRIGGERING LEVEL CONTROLS. The TRIGGER SLOPE switch and TRIGGERING LEVEL control are used to start the trace of any selected point on the triggering waveform. The TRIGGER SLOPE switch selects triggering on either the rising or the falling portion of the waveform. The TRIGGERING LEVEL control sets the level at which triggering takes place.

a. Figure 4-5 illustrates how the triggering point can be selected with the TRIGGER SLOPE and TRIGGERING LEVEL controls. The horizontal lines represent the level set by the TRIGGERING LEVEL control. The setting of the TRIGGER SLOPE control determines the point on the waveform at which triggering will occur. Any dc component of the triggering waveform can be offset by the setting of the TRIGGERING LEVEL control if the TRIGGERING MODE switch is in the DC position. For example, if the waveform has a negative dc component, the TRIGGERING LEVEL control must be set negative by this amount to give triggering equivalent to that obtained with a zero setting on a waveform without a dc component. The triggering level on DC internal triggering is affected by the setting of the VERTICAL POSITION control, which adds dc bias to the signal to displace it up or down. Thus, if the VERTICAL POSITION setting is changed, the trace will shift. To bring back the trace to its original position, readjust the TRIGGERING LEVEL control.

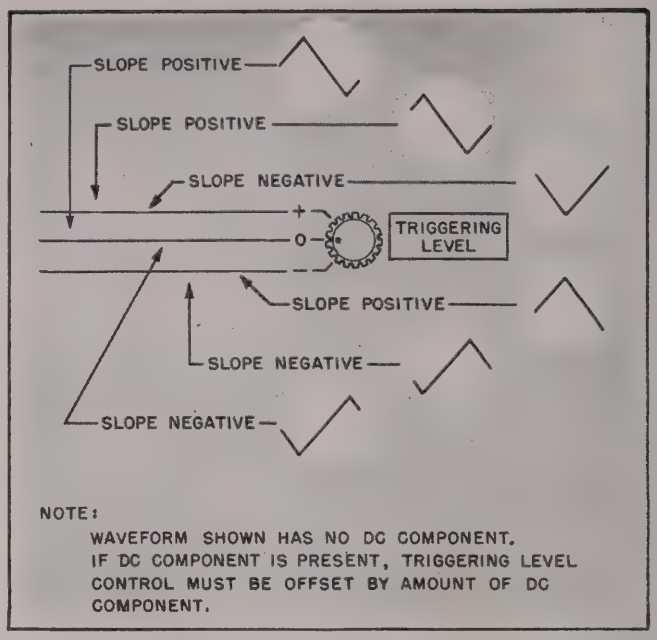


Figure 4-5. Use of Triggering Level and Trigger Slope Switches

4-24. USE OF STABILITY CONTROL. The STABILITY control is a threshold control for the main sweep circuits. It determines whether the main sweep circuit will run free and trigger the sweep recurrently, trigger the sweep only on receipt of a trigger, or not trigger the sweep at all, regardless of the incoming trigger.

a. Use the PRESET detent in the extreme counterclockwise position for most triggered modes of operation. This position will most often give reliable triggering. The control is continuously variable clockwise from the PRESET position.

b. Three positions of the STABILITY control generally used are as follows:

(1) FREE RUNNING. Turn the STABILITY control all the way clockwise to let the sweep run free. A horizontal trace will appear on the screen even when no trigger or vertical input is pre-

sent. If a vertical signal is present, it will not be locked.

(2) TRIGGERED. Turn the STABILITY control counterclockwise from full clockwise position until the trace just disappears, then continue five or ten degrees counterclockwise from this point. The sweep circuit is now set up for triggered operation. This setting of the STABILITY control duplicates that of the PRESET position.

(3) OFF. Turn the STABILITY control all the way counterclockwise, but not into the PRESET position. In this position, the sweep circuit will not be triggered by any signal.

4-25. TRIGGERING INSTRUCTIONS FOR MAIN SWEEP NORMAL OPERATION. Start the oscilloscope as described in paragraph 4-5 and proceed as follows:

a. Connect the probe to the signal source.

b. Connect the external trigger source to the TRIGGER INPUT connector if external triggering is used.

c. Set the preamplifier controls as required.

d. Set other controls as follows:

HORIZONTAL DISPLAY	MAIN SWEEP NORMAL.
TRIGGER SLOPE	As required by triggering mode in use.
TRIGGERING MODE	AC FAST, AC SLOW or DC, depending on conditions (refer to paragraph 4-22.)
TRIGGERING LEVEL	Fully ccw.
STABILITY	PRESET, or in triggered range.
TIME/CM and MULTIPLIER	Any setting that will display at least one cycle of the waveform.

e. Advance the TRIGGERING LEVEL control until the trace appears.

f. Adjust the TIME/CM and MULTIFLIER switches to display as many cycles of the waveform as desired.

g. Adjust the TRIGGERING LEVEL and TRIGGER SLOPE (+ or - position for trigger source used) until the desired portion of the waveform is displayed (see figure 4-5).

h. By setting the sweep faster than the period of the waveform, it is possible to display just the first part of the waveform. Try various settings of the TIME/CM, MULTIPLIER, TRIGGERING LEVEL, and TRIGGER SLOPE switches to obtain the best presentation.

i. If the trace is not stable with the STABILITY control on the PRESET position, advance the control until the trace stabilizes. The trace will disappear as the control is advanced from the PRESET position, and then reappear. If the control is advanced too far (into the free-running region), the waveform will become unlocked.

4-26. TRIGGERING INSTRUCTIONS FOR DELAYING SWEEP OPERATION. Differences between the main sweep and delaying sweep triggering procedures are described below.

a. There is no selection of triggering modes for the delaying sweep. All triggering is external but the delaying sweep may be triggered from the internal signal by using the patchcord as described in paragraphs 4-26c and 4-26d.

b. External triggering for delayed sweep must be applied to the TRIGGER OR EXT SWEEP IN connector. The trigger slope is determined by the setting of the SLOPE toggle switch, the action of which is the same as the TRIGGER SLOPE switch.

c. For internal triggering, connect the patchcord between the VERT SIG OUT connector and the TRIGGER OR EXT SWEEP IN connector.

NOTE

The TRIGGER OR EXT SWEEP IN connector is dc coupled to the sweep triggering circuits. However, if the delayed sweep is triggered from the VERT SIG OUT connector the triggering will be equivalent to AC slow because the VERT SIG OUT circuitry is ac coupled.

d. For triggering with the 60 cps line frequency, connect the patchcord between the 6.3v ac connector and the TRIGGER OR EXT SWEEP IN connector.

NOTE

Leave the ATTEN switch in the X1 position for all triggering. The X10 position of this switch is used only for external sweep inputs.

4-27. TRIGGERED OPERATING MODES.

4-28. MAIN SWEEP AUTOMATIC TRIGGERING OPERATION. This operation is suitable for displaying signal frequencies from 60 cps to approximately two mcs and is accomplished as follows:

a. Start the oscilloscope as described in paragraph 4-5.

b. Connect the probe (or probes) to signal source.

c. Set up the preamplifier controls for the type of operation desired.

d. Set the TRIGGERING MODE switch to AUTOMATIC and the TRIGGER SLOPE control to INT + or - as required to display the selected portion of the waveform (see figure 4-5).

e. Vary the TIME/CM and MULTIPLIER controls until a stable trace appears on the screen. To display a complete cycle, the sweep speed should be no greater than the period of one cycle of the waveform. The slower the sweep, the more cycles will be displayed.

4-29. DELAYING SWEEP OPERATION. When the HORIZONTAL DISPLAY switch is in the DELAYING SWEEP position, the delaying sweep circuit will display the trace and the main sweep will brighten the trace as described below.

a. Start the oscilloscope as described in paragraph 4-5.

b. Connect the probe to the signal source. Connect both probes for dual-trace operation, with preamplifier, Model No. 1823.

c. Connect trigger source to the TRIGGER OR EXT SWEEP IN connector.

d. Set the preamplifier controls as required.

e. Set the HORIZONTAL DISPLAY switch to the DELAYING SWEEP position.

f. Leave the ATTEN switch in the X1 position and set the LENGTH control to 10 CM. Turn the main sweep STABILITY control counterclockwise but not to PRESET. Turn the delaying sweep TRIGGERING LEVEL control counterclockwise. Rotate the STABILITY OR EXT SWEEP ATTEN control clockwise to the point where the delaying sweep free-runs and then rotate it five or ten degrees counterclockwise from that point. Rotate the TRIGGERING LEVEL control clockwise until a stable presentation is obtained.

g. To brighten any selected portion of the delayed sweep trace, turn the TRIGGERING MODE switch to HF, AC FAST, AC SLOW or DC, and the TRIGGER SLOPE switch to INT +. Turn the main sweep STABILITY control fully clockwise to let the main sweep run free.

h. Adjust the length of the brightened portion with the main sweep TIME/CM and MULTIPLIER switches. Increasing the sweep speed shortens the brightened portion, decreasing the sweep speed lengthens it.

i. Move the brightened portion of the trace to the right or left with the DELAY-TIME MULTIPLIER control. The dial setting is the horizontal distance in centimeters from the start of the trace to the start of the brightened portion. Read whole numbers of centimeters in the window at the top of the dial, fractions of centimeters to the nearest 0.01 on the dial face. Move the locking lever to the right to lock the dial. To convert the distance in centimeters to time measurements, refer to paragraph 4-40.

4-30. Main Sweep Delayed Operation. Main sweep delayed operation can be used to display any selected portion of the waveform. This mode can also be used to display a triggered waveform when the time delay between the trigger and the start of the waveform is too great to allow the waveform to be displayed on the screen except at such slow sweep speeds that the waveform is not expanded enough for detailed viewing. To use main sweep delayed operation, proceed as follows:

a. Display the entire waveform with the delaying sweep (refer to paragraph 4-29).

b. Advance the main sweep STABILITY control until the main sweep free-runs.

c. Brighten the selected portion of the delayed sweep waveform, using the main sweep TIME/CM and MULTIPLIER switches and the delaying sweep DELAY-TIME MULTIPLIER control as described in paragraph 4-29h and 4-29i.

d. Turn the LENGTH control counterclockwise until the trace stops just after the beginning of the brightened portion.

e. Turn the HORIZONTAL DISPLAY switch to MAIN SWEEP DELAYED. The brightened portion of the trace will be spread across the entire screen.

4-31. TRIGGERED MAIN SWEEP DELAYED OPERATION. In this mode, the delayed sweep blocks all triggers from the main sweep trigger circuits until after the delayed time is over. The next trigger will then trigger the main sweep. To operate in this mode:

a. Display the entire waveform with the delaying sweep (refer to paragraph 4-29).

b. Turn the HORIZONTAL DISPLAY switch to MAIN SWEEP NORMAL and set up the MAIN SWEEP controls for triggered operation by either of the following methods:

(1) Turn the TRIGGERING MODE switch to AUTOMATIC.

(2) Turn the TRIGGERING MODE switch to AC FAST, AC SLOW or DC. Turn the main sweep STABILITY control to PRESET, or turn it clockwise until the trace disappears then back off 5 or 10 degrees counterclockwise. Advance the TRIGGERING LEVEL control to give triggered operation.

c. Turn the HORIZONTAL DISPLAY switch back to DELAYING SWEEP and adjust the main sweep TIME/CM and MULTIPLIER controls for the desired length of the brightened portion.

d. Operate the DELAY-TIME MULTIPLIER control and the trigger SLOPE switch to brighten the desired portion of the trace. As the DELAY-TIME MULTIPLIER control is turned, the brightened portion of the trace will move abruptly from one triggering point to the next.

e. Turn the HORIZONTAL DISPLAY switch to MAIN SWEEP DELAYED. The brightened portion will be displayed full screen width.

f. The DELAY-TIME MULTIPLIER switch selects a point along either the main or delaying sweep at which

the delayed trigger pulse (which initiates the main sweep) is produced. The dial setting is the horizontal distance from the start of the sweep to the delayed trigger. If this value is multiplied by the sweep speed, the product is the time interval between the start of the sweep and production of the delayed trigger.

g. With the HORIZONTAL DISPLAY switch in the MAIN SWEEP NORMAL position, the delayed trigger is produced by the main sweep and fed to the DEL'D TRIG FROM MAIN OR DEL'G SWEEP connector. Time delays from 0.08 microsecond to 120 seconds can be produced for use with external equipment. In the DELAYING SWEEP position the pulse is produced by the delaying sweep.

EXAMPLE:

> To obtain a time delay of 2.2 usec, set the TIME/CM OR DELAY TIME switch to 2 MICROSEC. Sweep speed is then 2 usec per centimeter. Set the DELAY-TIME MULTIPLIER dial to 1.10. Time delay will be 2 usec per centimeter times 1.10 centimeters = 2.2 usec.

4-32. SINGLE SWEEP DISPLAY OF TRANSIENTS.

a. The RESET MAIN SWEEP pushbutton can be used to start a single sweep or to arm the main sweep trigger circuits to trigger a single sweep upon receiving a trigger pulse, depending upon the setting of the main sweep STABILITY control. The controls are set up for main sweep delayed operation and the delaying sweep STABILITY control is turned fully ccw to disable the delaying sweep. If the main sweep STABILITY control is backed off to the point where the main sweep requires a trigger, the READY lamp lights (when the RESET MAIN SWEEP button is pushed) to indicate that the main sweep is ready to receive a trigger. The next trigger to the main sweep will cause a single sweep and the READY lamp will go out. If the main sweep STABILITY control is turned fully cw, a single sweep is initiated by pushing the RESET MAIN SWEEP button. This button must be pushed each time another single sweep is desired in either mode.

b. Single sweeps are useful for observing a single transient. If the transient is to be observed at two points in a circuit, preamplifier Model No. 1823 should be employed. Both input channels must be used. The MODE switch must be turned to the CHOPPED position to make sure that both amplifiers are conducting when the transient occurs. Since each amplifier alternately conducts for five usec and is off for five usec, the amount of detail to be observed determines how short a transient can be observed.

c. To initiate a single sweep proceed as follows:

(1) Turn STABILITY control clockwise.

(2) Set other controls to main sweep delayed operation as described in paragraph 4-30 except to set the delay sweep STABILITY control ccw.

(3) Press the RESET MAIN SWEEP button. There will be a single trace.

d. For triggered single sweep operation proceed as follows:

(1) Turn the STABILITY OR EXT SWEEP ATTEN control ccw.

(2) Set other controls for triggered main sweep delayed operation (paragraph 4-30).

(3) Press the RESET MAIN SWEEP button. The READY lamp will glow, indicating that the main sweep is ready for a trigger. When the trigger occurs, there will be a single sweep and the READY lamp will go out.

4-33. USE OF TRIGGER RATE GENERATOR.

a. Start the oscilloscope as described in paragraph 4-5.

b. Turn the HORIZONTAL DISPLAY switch to DELAYING SWEEP, and advance the delaying sweep STABILITY control to let the delaying sweep run free.

c. Take the output from the DEL'D TRIGGER connector. The trigger occurs each time the sweep runs.

d. The trigger rate may be varied from 10 cps to 40 kcs by varying the TIME/CM OR DELAY TIME switch and LENGTH controls. The time between triggers may be calculated by multiplying the length of the trace on the screen by the TIME/CM OR DELAY TIME dial setting.

4-34. EXTERNAL SWEEP INPUT.

a. Connect the source of external signal to the TRIGGER OR EXT SWEEP IN connector.

b. Turn the HORIZONTAL DISPLAY switch to EXT SWEEP and the 5X MAGNIFIER to ON.

c. Control the horizontal gain with the delaying sweep STABILITY OR EXT SWEEP ATTEN control. If the signal is too large, set the ATTEN toggle switch to X10.

4-35. EXTERNAL TRACE BRIGHTNESS MODULATION.

a. At the rear of the oscilloscope (see figure 1-3), loosen both the GROUND and the CRT CATHODE binding post knobs.

b. Swing the grounding strap out of the way and tighten the GROUND binding post knob to hold the strap in place.

c. Connect the external source to the CRT CATHODE binding post. The input is AC coupled, and requires about 20 v to blank a normal intensity trace.

4-36. VOLTAGE MEASUREMENTS. To measure voltage between any two points on the displayed waveform, measure the vertical distance in centimeters between these two points and multiply by the product of the VOLTS/CM switch setting and the attenuation of the probe. (The VARIABLE control must be in the CALIBRATED position.) The result is the voltage

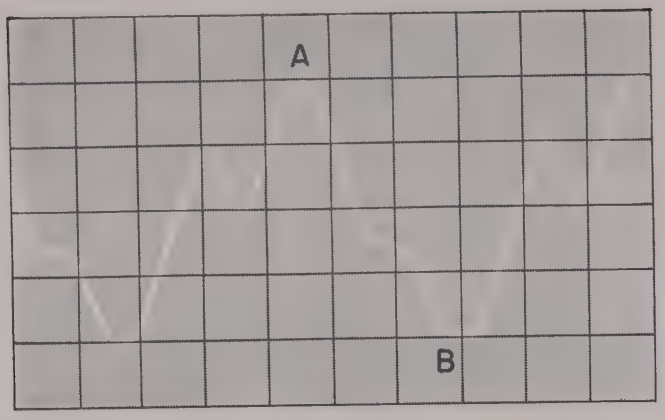


Figure 4-6. Measuring Peak-to-Peak Voltage

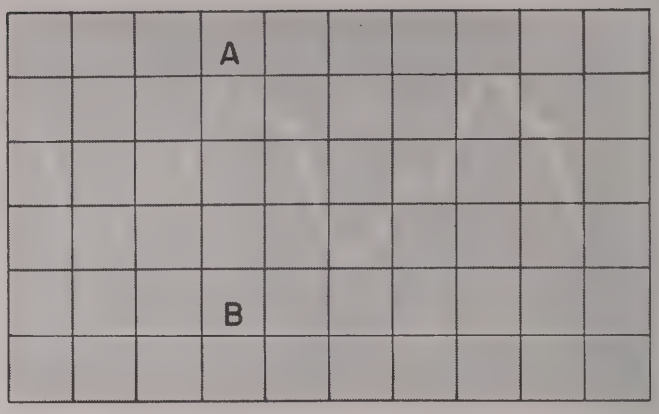


Figure 4-7. Measuring Voltage With Respect to Ground

within three percent. For easier reading of fractions of centimeters, shift the trace with the HORIZONTAL POSITION control until the point to be measured falls on the vertical center line. Keep the intensity dim to get the sharpest possible trace. Deflections can be measured to the nearest 0.05 centimeter.

4-37. MEASURING PEAK-TO-PEAK VOLTAGE. Refer to figure 4-6 which shows a waveform displayed when a 10X probe is used and the preamplifier controls are set as follows:

AC-DC switch	AC
VOLTS/CM	.05
VARIABLE	CALIBRATED

a. In measuring peak-to-peak voltage of this waveform, measure the amount of vertical deflection from point A, the positive peak, to point B, the negative peak (4 cm). Multiply this figure by the VOLTS/CM switch setting (.05); the result is 0.2 volt.

b. This figure represents the voltage present at the INPUT connector of the preamplifier. Multiply this result by 10, the attenuation ratio of the probe. This gives 2 volts as the peak-to-peak voltage of the displayed waveform.

4-38. MEASURING A PEAK WAVEFORM VOLTAGE WITH RESPECT TO GROUND. (See figure 4-7.) Set the AC-DC switch on the preamplifier to DC and the VARIABLE control to CALIBRATED. Proceed as follows:

a. Adjust the oscilloscope for a free running trace, or use AUTOMATIC triggering mode baseline.

b. Touch the probe tip to the oscilloscope ground terminal.

c. Adjust the VERTICAL POSITION control to set the trace at a convenient position, such as B, figure 4-7.

d. Disconnect the probe tip from the ground terminal and connect it to the waveform source without disturbing the VERTICAL POSITION control. Adjust the oscilloscope controls for a stable display.

e. Observe the vertical distance between the peak waveform voltage A and the original trace position, B. If this distance is inconveniently large or small, reset the VOLTS/CM switch to a more suitable position and repeat the above procedure.

EXAMPLE:

Suppose the vertical distance between A and B is 4 cm when a 10X probe is used and when the VOLTS/CM switch is set at 0.1. Multiply distance between A and B (4 cm) by the VOLTS/CM switch setting (0.1) and by the probe attenuation ratio (10). This shows the peak voltage of the waveform with respect to ground to be 4 volts.

4-39. TIME MEASUREMENTS USING SCALE DIVISIONS. Keep the intensity low to obtain the sharpest possible trace and proceed as follows:

a. Measure the horizontal distance in centimeters between the two selected points on the waveform. Move trace up or down with VERTICAL POSITION control to bring selected point into coincidence with horizontal axis for ease in reading fractions of centimeters.

b. Multiply distance in centimeters by setting of the TIME/CM switch. Multiply the product by MULTIPLIER switch setting. The result is the time interval within three percent.

EXAMPLE:

Distance between points	2.1 Centimeters
TIME/CM setting	100 usec
MULTIPLIER setting	2
2.1 x 100 x 2 =	420 usec ± 3%

4-40. TIME MEASUREMENTS BY DELAY-TIME MULTIPLIER. Time intervals may be measured by setting the start of the brightened portion at point to be measured and multiplying the TIME/CM or DELAY TIME and DELAY-TIME MULTIPLIER controls setting. This gives elapsed time from start of the trace more accurately than a direct measurement from graduations on the scale. Proceed as follows:

a. Display waveform with the delaying sweep.

b. Brighten the trace with the main sweep and turn main sweep TIME/CM and MULTIPLIER switches clockwise until brightened portion becomes just a spot.

c. Operate the DELAY-TIME MULTIPLIER control to position spot on one of the selected measuring points on the scale. Note the dial reading.

d. Move the spot to the other selected measuring point and again note dial reading.

e. Subtract smaller dial reading from the larger dial reading to find distance in centimeters between the two points. Multiply this reading by setting of the TIME/CM OR DELAY TIME control.

EXAMPLE:

> If the dial reading in paragraph 4-40c was two and the dial reading in 4-40d was five, the difference would be three centimeters. If the TIME/CM OR DELAY TIME control is set to 100 MICROSEC, the time interval is 3 x 100 = 300 microseconds.

4-41. OPERATION OF PREAMPLIFIER, MODEL NO. 1822. Preamplifier, Model No. 1822, is a wide band, high gain preamplifier used to display either of two signals connected to the input connectors. Refer to figure 4-3 for a functional description of front panel controls and terminals. To operate, proceed as follows:

a. Make necessary adjustments to GAIN ADJ and DC BAL controls as described in paragraphs 4-10 and 4-11.

b. TRACE PRESENTATION.

(1) Connect the RF connectors of the probe to the input connector. Connect the probe itself to the signal source with the ground lead connected to a suitable ground.

(2) It is sometimes unnecessary or undesirable to display the dc level of the waveform. In these instances, place the INPUT SELECTOR switch in the AC position.

(3) Set the VARIABLE control to the CALIBRATED position. Set the VOLTS/CM switch to the position which will display the entire waveform on the screen. Use the VERTICAL POSITION control to center the trace on the screen.

(4) To enlarge or reduce the trace vertically, turn the VOLTS/CM switch to the position which best suits viewing needs. Make finer adjustments in the height of the trace by turning the VARIABLE control.

(5) If two signal sources are being utilized, select the desired signal for presentation by turning the INPUT SELECTOR switch to either INPUT A or INPUT B.

4-42. OPERATION OF PREAMPLIFIER, MODEL NO. 1823. The two-channel preamplifier, Model No. 1823, may be used for single or dual-channel display. All preamplifier controls are located on the front panel.

a. Make necessary adjustment to GAIN ADJ and DC BAL as described in paragraphs 4-12 and 4-13.

b. SINGLE TRACE PRESENTATION.

(1) Turn MODE switch to the desired channel (A only or B only).

(2) Connect the probe to the signal source.

(3) If the waveform to be observed contains an undersirable dc component, move the AC-DC switch to the AC position. This position blocks all components under two cps.

(4) Set the VARIABLE control to the CALIBRATED position, and set the VOLTS/CM switch to the position that will display the entire waveform on the screen. Start with the VOLTS/CM switch fully counterclockwise and turn it clockwise until the entire trace comes into view. Use the VERTICAL POSITION control to center the trace on the screen.

(5) If voltages are not to be measured, the VARIABLE control may be turned counterclockwise to reduce the trace height. To make the trace occupy as much of the vertical area as possible turn the VOLTS/CM switch to the position that just puts the top and bottom of the waveform off-screen, and bring the whole trace back into view by turning the VARIABLE control counterclockwise.

(6) To expand a selected part of the trace vertically, turn the VOLTS/CM switch clockwise to a more sensitive position. This will put some of the trace off the screen. If the part to be observed is not on the screen, bring it back by moving the trace up or down with the VERTICAL POSITION control.

(7) Invert the trace with the POLARITY switch, if desired. In the NORMAL position, positive-going pulses appear positive-going on the screen. In the INVERTED position, positive input pulses appear negative-going.

c. DUAL-TRACE PRESENTATION. To display two traces, connect probes from both channel inputs to the points to be measured.

(1) Use CHOPPED position of the MODE switch for displaying continuous waveforms at slow sweep speeds (1 millisecond per centimeter or less). This mode eliminates most of the flicker present with alternating sweeps at slow speeds. However, this mode is not suitable for internal triggering.

(2) Square waves or sharp pulses at slow speeds may be difficult to sync in the CHOPPED mode.

Try the CHOPPED mode for these waveforms and switch to ALTERNATE if the trace is not stable, or use external sync.

(3) Use the ALTERNATE position of the MODE switch for all sweep speeds faster than one millisecond per centimeter.

4-43. OPERATION OF PREAMPLIFIER, MODEL NO. 1824. Either of two signal inputs can be presented on the oscilloscope, or two signal inputs can be connected so that the signal presented to the main vertical amplifier in the oscilloscope is the difference between the two. To operate, proceed as follows:

a. Make necessary preliminary adjustments to DIFF BAL control as described in paragraph 4-14.

b. Allow preamplifier to warm up when power is first applied so that the preamplifier can stabilize. Normally it will stabilize after approximately five minutes.

c. SINGLE TRACK PRESENTATION.

(1) Turn input selector switch to choice of either input. The DC and AC positions of this switch differ only in that in the AC position unwanted components below two cps of the signal are removed. The input presents a 180 degree out-of-phase display. Positive going is displayed as negative going.

(2) Set the VARIABLE control to the CALIBRATED position. Except when sensitivities in excess of 10 millivolts are required, set the MC/CM MULTIPLIER control in the 10, 20 and 50 positions.

(3) Set the MILLIVOLTS/CM control to the position that will display the entire waveform on the screen. Use the VERTICAL POSITION control to center the trace on the screen.

(4) To enlarge the trace vertically or to reduce it, turn the MILLIVOLTS/CM switch to the position which best suits viewing needs. (Make finer adjustments in the height of the trace by turning the VARIABLE control if calibrated operation is not necessary.)

d. DIFFERENTIAL TRACE PRESENTATION. To display two input signals differentially, connect probes from both channel inputs to the points to be measured. Place the input selector switch on either AC, A-B position or DC, A-B position.

e. PREAMPLIFIER BALANCE. If the controls are set properly, the trace will not shift vertically when the MULTIPLIER switch is rotated. If it does, proceed as follows:

(1) Set the MILLIVOLTS/CM switch to 100 and the MULTIPLIER switch to 50.

(2) Position the trace near the center of the screen and turn the MULTIPLIER switch to 20. Return the trace to center with the FINE control and, if necessary, with the PREAMP BALANCE switch.

(3) Continue turning the MULTIPLIER to the 10 and 5 positions adjusting the PREAMP BALANCE controls as necessary until there is no trace shift as the MULTIPLIER control is switched between the 5 and 50 positions.

(4) Any shift remaining as the MULTIPLIER control is switched to one may be partially compensated for by a further adjustment of the FINE control. If this does not correct shifting, refer to paragraph 7-42a for adjustment of the 2ND STAGE PLATE BAL potentiometer (an internal adjustment).

SECTION V
PERIODIC INSPECTION, MAINTENANCE AND LUBRICATION

5-1. PERIODIC INSPECTION.

5-2. GENERAL. Periodically inspect the oscilloscope and the preamplifiers as directed in figure 5-1. These inspections are performed to maintain the equipment in a serviceable condition and to detect faults and failures before extensive and time consuming repairs and replacements are required. If periodic inspections are carried out many of the common faults and breakdowns may never occur. Keep the oscilloscope clean and free of dust and moisture. Check to see that no part of the equipment is being abused or neglected. If deficiencies are not corrected during the inspection, refer to Section VI for trouble shooting and remedial action instructions.

5-3. To inspect the oscilloscope as directed in figure 5-1, remove the side panels by releasing the fasteners near the front and back (see figure 1-1). Swing the top of the side panel away from the oscilloscope until the bottom hinge releases. To remove the bottom panel, release the four fasteners and lift it off. (Only two or three turns are necessary to release the fasteners.)

WARNING

Exercise care when working with the oscilloscope while its covers are off. The 500 volt and 350 volt buses are particularly dangerous. Do not hold metal frame of instrument with one hand while touching parts with the other hand. Stand on a dry insulated floor. Keep one hand in pocket, and use insulated tools when checking the instrument.

COMPONENT	TIME INTERVAL	INSPECT FOR
Entire Oscilloscope and Preamplifiers	Monthly	General cleanliness Mechanical stability and rigidity Chipped paint, rust, corrosion
Resistors	Monthly	Charred and blistered condition, discoloration, loose and broken leads
Selinium Rectifiers	Monthly	Dark burn spots, loose connections Broken terminals
Fan	Monthly	Operates with POWER switch in ON position
Fan Motor Bearings	Every two months	Dry bearing needing lubrication
All Wiring	Monthly	Loose connections, insulation breakdown
Power Cable	Monthly	Insulation breakdown, cuts, fraying
Plug Connectors	Monthly	Bent pins (male end), broken insulation (female end)
Probes	Monthly	Cracked insulation, broken ground leads, cracked probe casing
Potentiometers	Semi annually	Freeness of movement - burnouts Loose connections, broken terminals
Tubes	Monthly	Lighted filaments, looseness in sockets
Dials and Controls	Monthly	Freeness of movement (tap controls lightly to check for cut-out due to loose contacts)
Air Filter	Quarterly	Cleanliness - clogged pores

Figure 5-1. Table of Periodic Inspection Points (Sheet 1 of 2)

COMPONENT	TIME INTERVAL	INSPECT FOR
Electrolytic Capacitors	Monthly	Leaking or encrusted electrolyte, discoloration, bulging containers
Paper and Mica Capacitors	Monthly	Melting containers, wax oozing from ends
Power Transformer	Monthly	Discolored or charred case, burnt smell, oozing sealant
Rotary Switches	Monthly	Corrosion at switch points - Firm contact of movable arm with each contact point, broken terminals or decks.
Beam Position Indicators	Monthly	Lights correctly as trace is shifted
Power Lamp	Monthly	Lamp lights when POWER switch is ON

Figure 5-1. Table of Periodic Inspection Points (Sheet 2 of 2)

5-4. PREVENTIVE MAINTENANCE.

5-5. GENERAL. Preventive maintenance for the oscilloscope and preamplifiers consists of the periodic inspections tabulated in figure 5-1 and of the cleaning, and oiling instructions given below.

5-6. CLEANING. Loose dust causes overheating of electrical components and should be removed. Use a small portable vacuum cleaner or blow dust out with clean dry compressed air of about 30 psi. Clean off surface film with a dry lint-free cloth or, if necessary, one that is dampened with an approved solvent, such as trichlorethylene, Specification MIL-T-7003.

CAUTION

Exercise care to avoid touching any of the screws that control the trimmers, padders or alignment devices.

a. AIR FILTER. To clean the air filter, run hot water through it from the side which was against the back plate of the oscilloscope or dip the filter into hot soapy water. Rinse it in clean water. Dry the filter thoroughly and coat it with an appropriate adhesive such as "FILTER COAT", manufactured by Research Products Corporation, Madison, Wisconsin.

5-7. LUBRICATION. Oil the fan motor bearings every two months at the points shown in figure 5-2. Use a light-weight high-grade oil, such as Specification MIL-O-6085, and apply only a drop or two. No other lubrication of the oscilloscope is required.

Figure 5-2. Oiling Fan Motor Bearings

5-8. Replace the side and bottom covers by reversing the process described in paragraph 5-3.

SECTION VI
TROUBLE SHOOTING

6-1. GENERAL TROUBLE SHOOTING INSTRUCTIONS.

6-2. The oscilloscope is a complex electronic instrument. There is, in some instances, no simple way of locating troubles. The manufacturer recommends, therefore, that according to the limitations of this publication, trouble shooting and maintenance consist of, (1) the adjustments required to compensate for changes in circuit elements, (2) recalibration and (3) replacement of tubes and obviously damaged components. If the oscilloscope does not operate correctly after making the adjustments or replacements described, refer to the next highest level of maintenance.

6-3. TUBE FAILURE. The majority of troubles within the oscilloscope will be caused by tube failure. Replacing the bad tube with a good one will frequently correct the trouble. It should be kept in mind, however, that tube failure may be caused by failure of a component in the same or in a related circuit. Often faulty components can be found by visual inspection (discolored or burned resistors, leaking, or burned capacitors).

a. Combine the available evidence to localize the trouble to one section. For example: if there is no vertical deflection, the trouble may lie within the vertical input or output amplifiers or in the preamplifier.

b. To check for tube failure and to make internal adjustments or replacements, remove the side panels by releasing the fasteners (two or three turns) near the front and back. Swing the top of the panel away from the oscilloscope until the bottom hinge releases, then lift off the panel.

c. Tube testers cannot be depended upon to find all possible defects in a tube. A more reliable method is to substitute tubes known to be serviceable for suspected faulty ones. This may save considerable time in trouble localizing since a tube which tests satisfactorily in a tube tester may fail in a particular application.

d. Substitution checking is also an excellent method of determining whether or not a preamplifier is faulty. Simply substitute the suspected faulty preamplifier by a known good one.

e. Refer to figure 6-1 which tabulates the troubles which may develop within the oscilloscope and the preamplifiers. Check out each of the probable causes and follow through with the servicing, adjustment, recalibration or replacement procedures in the REMEDY column.

6-4. REPAIR. Corrosion at a switch point should be removed carefully with either a solvent or a fine abrasive. Other repair instructions are listed below.

a. Exercise care to observe the correct polarity when replacing selenium rectifiers and electrolytic capacitors.

b. Run replacement wiring as close as possible to the original position, being expecially careful of lead dress.

6-5. Color coding of leads is employed to help identify the various circuits during repair procedures. The color codes are as follows:

a. Power Supply Voltages:

-150v	yellow with brown stripe
ground	yellow with red stripe
+100	yellow with green stripe
+225	yellow with blue stripe
+350	yellow with grey stripe
+500	yellow with white stripe

b. Filament Voltage Supply (6.3 v):

Orange with grey stripe	(to V601, V602 and V603)
Orange with brown stripe	(to main sweep chassis)
Orange with yellow stripe	(to delaying sweep chassis)
Orange with red stripe	(to power supply chassis)
Orange with blue stripe	(to vertical chassis and preamplifier)
Orange with green stripe	(to crt)
Orange with purple stripe	(to main sweep, delaying sweep and vertical output amplifier.)

c. 340v Unregulated Supply:

Yellow with purple stripe.

d. Signal Carrying Leads:

Solid color or white with colored stripe.

e. All 110 vac Wires:

Orange with white stripe.

6-6. REALIGNMENT. Realignment should be a last resort used only after other remedies are exhausted. If realignment is necessary, refer to Section VII.

6-7. REPLACEMENT PARTS. Use replacement parts authorized only by the applicable Illustrated Parts

Breakdown (T.O. 33A1-13-66-4). When the serviceability of a part is questionable and repair of the part is impracticable (parts such as tubes, capacitors, resistors, etc.) that part should be replaced. If a component checks properly but shows signs of having been subjected to severe overheating or overloading, that component should be replaced as a potential source of trouble.

6-8. SPECIAL REPLACEMENTS. Certain tubes are provisioned as matched pairs while others are especially selected and aged by the manufacturer. The fact that these parts have been selected for certain characteristics is indicated in the parts list and special consideration should be given when requisitioning them. Replace both tubes in a matched pair even if only one is defective.

WARNING

Exercise care when replacing the crt. A dangerous implosion may result if tube is handled carelessly.

TROUBLE	PROBABLE CAUSE	REMEDY
OSCILLOSCOPE		
Oscilloscope fails to operate.	Power cord not connected.	Connect power cord to power outlet and to receptacle in back of oscilloscope.
	Power not available at power outlet.	Check voltage at power outlet.
	Blown fuse.	Replace fuse.
	Transformer open or shorted.	Refer to next higher level of maintenance.
Power lamp is out but fan stays on.	Thermal cutout has tripped.	Leave power on and fan running. Wait until equipment cools, and starts again.
		Check that thermal cutout trips out at 128°F and trips in at 98°F. Replace if faulty.
	Burned out pilot lamp.	Replace pilot lamp.
Oscilloscope fails to operate properly, but pilot lamp still glows.	Wrong control setting.	Check controls and reset if necessary.
	Faulty probe and external trigger connections.	Check and reconnect if necessary.
	Faulty external connections.	Check and readjust if necessary.
	Faulty equipment under test.	Repair or reject equipment for further use.
Oscilloscope repeatedly overheats.	Fan inoperative.	Repair or replace fan.
	Poor air circulation.	Relocate oscilloscope or provide forced air circulation.
	High ambient temperature.	Relocate oscilloscope or provide forced air circulation.
	Faulty thermal cutout.	Replace thermal cutout.
	Dirty air filter	Wash filter as described in paragraph 5-6a.
Loss of trace.	Trace positioned off the screen.	Check beam position indicators and make necessary adjustments with VERTICAL POSITION and HORIZONTAL POSITION controls.
	Misadjustment of front panel controls.	Check front panel controls and make necessary adjustments.

Figure 6-1. Trouble Shooting Table (Sheet 1 of 6)

TROUBLE	PROBABLE CAUSE	REMEDY
Loss of trace (continued)	Faulty sweep circuit.	Check main sweep speed rates as directed in paragraph 7-22. If trace is still lost, refer to next highest level of maintenance.
	Faulty tube or tubes in sweep circuits.	Check tubes and replace as necessary.
	Faulty tube or tubes in main vertical amplifier or in pre-amplifier.	Check tubes and replace as necessary.
	Misadjustment of alignment controls in preamplifier.	Check preamplifier adjustments as directed in paragraphs 7-26, 7-33 and 7-39.
	Defective high voltage supply.	Check power transformer, filter and rectifier circuits.
	Defective low voltage supply.	Check power transformer, filter and rectifier circuits.
No control of focus or intensity.	Cathode-ray tube socket loose or dirty.	Check cathode-ray tube socket and repair or replace as required.
	High voltage bleeder open.	Check high voltage bleeder and replace if necessary.
	Cathode-ray tube.	Check cathode-ray tube and replace if necessary.
	Faulty FOCUS control.	Check FOCUS control for opens or shorts and replace if necessary.
Defective horizontal positioning.	Faulty tube or components in cathode follower stages.	Check tubes and components and replace as required.
	Faulty HORIZONTAL POSITION control.	Check HORIZONTAL POSITION control for opens or shorts and replace if necessary.
	Defective low voltage power supply.	Check low voltage power supply and replace defective elements.
	Leads to deflection plates loose or broken.	Check leads to deflection plates and tighten, adjust or replace.
Vertical deflection but poor frequency response	Defective preamplifier or components in vertical amplifier (tubes, etc.)	Repair or replace preamplifier.
No horizontal sweeps on some settings.	Faulty sweep generator or sweep amplifier tubes.	Check sweep generator tubes and replace defective tubes.
No horizontal sweep on any setting with Main Sweep Stability control cw and trigger mode switch on AC, SLOW	Faulty sweep generator or sweep amplifier tubes and components.	Check sweep generator or sweep amplifier and replace defective tubes and components.
	Defective low voltage supply.	Check low voltage supply and replace defective components.
	Defective TIME/CM switch.	Check TIME/CM switch and replace if necessary.
Trace does not lock in synchronism	Defective triggering circuitry.	Check tubes and components.

Figure 6-1. Trouble Shooting Table (Sheet 2 of 6)

TROUBLE	PROBABLE CAUSE	REMEDY
Trace does not blank on retrace.	Defective tubes or components in crt unblanking circuit.	Check unblanking mixer and amplifier.
Trace cannot be positioned on crt	VERTICAL POSITION control on preamplifier faulty.	Check and replace VERTICAL POSITION control if necessary.
	HORIZONTAL POSITION control faulty.	Check and replace HORIZONTAL POSITION control if necessary.
	Preamplifier not fully seated.	Tighten captive screw.
Vertical deflection does not respond to calibrated value.	Gain control misadjusted.	Readjust gain control as described in paragraphs 4-10 and 4-13.
	Faulty tube in preamplifier.	Check tubes in first or second amplifier stages.
	Faulty low voltage power supply.	Check low voltage power supply and replace defective components.
	Faulty tube in vertical amplifier.	Check tubes in vertical amplifier and replace if necessary.
Distorted Waveform.	Frequency distortion caused by preamplifier.	Adjust LOW FREQ COMP control as described in paragraph 7-32.(Preamplifier, Model No. 1822).
		Replace faulty cathode and screen bypass capacitors in preamplifier, or refer to next highest level of maintenance.
	Frequency distortion caused by improperly adjusted probe.	Readjust probe as described in paragraph 4-9.
	Insufficient high frequency peaking.	Check tubes in preamplifier (especially check transconductance of tubes).
		Check for shorted peaking coils (look for fallen solder on coils).
Long time constant over or under shoot on a square wave.	Misaligned DC SHIFT COMP control.	Adjust DC SHIFT COMP control (see figure 7-2).
	AC-DC control in AC position.	Return control to DC position.
Sides, top and bottom of solid raster are not straight.	Misaligned GEOM ADJ control.	Adjust GEOM ADJ control as described in paragraph 7-6.
Poor square wave response down to 50 cps when using AC only and high sensitivity positions of VOLTS/CM switch on preamplifier.	Misaligned low frequency compensation.	Adjust LOW FREQ COMP as described in paragraph 7-32.
Readjustment required of TRIGGERING LEVEL control as TRIGGER SLOPE switch is changed from + to -.	Misaligned TRIGGERING LEVEL CENTERING control.	Adjust TRIGGERING LEVEL as described in paragraph 7-8.

Figure 6-1. Trouble Shooting Table (Sheet 3 of 6)

TROUBLE	PROBABLE CAUSE	REMEDY
Sweep triggers erratically or on wrong slope.	Misaligned TRIGGER SENSITIVITY control.	Adjust TRIGGER SENSITIVITY control as described in paragraph 7-11.
Waveform cannot be displayed (Horizontal trace present).	Open circuit in preamplifier or main vertical amplifier.	Check tubes in preamplifier and main vertical amplifier. Check amplifier circuit components. If trouble cannot be located, refer to next highest level of maintenance.
	Preamplifier not fully seated.	Tighten captive screw.
Vertical positioning non-symmetrical at ends of control.	Preamplifier VERT POS RANGE control misadjusted.	Adjust VERT POS RANGE control (see figures 7-8 and 7-11).
	Main vertical amplifier unbalanced.	Check tubes and components.
	Defective tube in main vertical amplifier or in preamplifier.	Replace tube pair V101, V102, figure 6-5, if defective (matched pair).
Signal compression at extremes of vertical deflection.	Vertical positioning non-symmetrical at ends of control.	Adjust VERT POS RANGE control, balance main vertical amplifier or replace tube pair V101 and V102, figure 6-5.
	Faulty distributed amplifier stage.	Check currents and biases on distributed amplifier tubes to find faulty stage.
Sweep non-linear on main sweep TIME/CM ranges 5, 2 and 1	Leaky timing capacitor.	Check C225 ABC, figure 6-6 and replace if necessary.
	Miller tube (V212) drawing grid current.	Check V212, figure 6-6 by substitution.
Sweep non-operative.	Shorted timing capacitor.	Check C225 ABC, C228 and C235, figure 6-6. Replace if necessary.
Sweep speed out of tolerance on slow speed ranges.	Capacitor C230 misadjusted.	Readjust C230 as described in paragraph 7-22.
Sweep speed much faster than TIME/CM control indicates.	Open timing capacitor.	Check timing capacitors and replace if necessary (refer to paragraphs 7-22 and 7-25).
500, 350, 225, 100, -150 Volt supplies off value.	A tube in DC series filament string has open filament.	Check V408, V409, figure 6-7 and series string tubes in preamplifier.
	Wire-wound reference resistor out of tolerance.	Check R620, R621, figure 6-8 and replace if necessary.
	VR tube (5651) giving wrong reference voltage.	Check for 87 volts at V613, figure 6-8, pins 2, 4 and 7.
High voltage crt supply not functional (filaments of V703, V707, figure 6-4, not lit).	Breakdown of V704 cathode to ground.	Alter dress of tube; clean adjacent area of dirt with a brush and solvent.
	Shorted turns or interwinding short or short to ground in transformer.	Replace transformer T701, figure 6-4.
	CRT spiral has developed short at high voltages.	Test crt by substitution and replace if necessary.

Figure 6-1. Trouble Shooting Table (Sheet 4 of 6)

TROUBLE	PROBABLE CAUSE	REMEDY
Incorrect ctr supply voltages.	HV ADJ potentiometer setting incorrect.	Readjust HV ADJ potentiometer as described in paragraph 7-4c.
	Low voltages incorrect.	Check low voltage power supplies.
	Faulty tubes.	Check V701, V702, figure 6-4.
	Spurious oscillation (Open filter capacitor).	Check C720, C721, C711, C716, C707, C706, C708 and C709, figure 6-4.
Intensity potentiometer gives non-linear control of brightness.	Defective crt.	Check crt by substitution.
Sweep non-linear or out of tolerance at high sweep speeds.	Maladjusted timing capacitors.	Adjust timing capacitors C225ABC, C228 and C235, figure 6-6.
	Poor lead dress wires to 5X MAGNIFIER switch.	Redress away from nearby metal parts.
	Sweep amplifier tubes not matched.	Check pairing of V503B and V505B, figure 6-3, by substitution of a known good pair.
No base line present in AUTOMATIC triggering.	Grid current on input tube of automatic multivibrator.	Check V202, figure 6-6, by substitution.
Calibrator waveform non-symmetrical.	Grid current present in calibrator multivibrator.	Check V751, figure 6-2, by substitution.
Delaying sweep length control out of range.	Incorrect trim resistors on potentiometer.	Replace R455 and R457, figure 6-7, to give correct operation.
No sweep present in MAIN SWEEP DELAYED position of HORIZONTAL DISPLAY switch although delaying and main sweeps work correctly.	Malfunction in delaying sweep trigger circuits.	Check V411, V412, V413 and V414, figure 6-6. Replace if necessary.
Insufficient high frequency response - Poor high frequency square wave response.	Faulty vertical amplifier tubes.	Check tubes by substitution.
	Faulty preamplifier tubes.	Check tubes by substitution.
	Preamplifier misaligned.	Recalibrate as described in paragraphs 7-26, 7-33 and 7-39.
PREAMPLIFIERS		
Loss of trace.	Open peaking coils.	Check and replace peaking coil if necessary.
Preamplifier, Model No. 1823, will not work on ALTERNATE and/or CHOPPED.	Defective tube in multivibrator.	Check V801, figure 6-10 and V209, figure 6-6 Replace tube if necessary.
Blows fuses upon rotation of a potentiometer.	Potentiometer mounting loose and causing a short.	Tighten potentiometer such that its terminals do not short.
Erratic operation with VARIABLE control.	Dirty VARIABLE potentiometer.	Clean or replace potentiometer.

Figure 6-1. Trouble Shooting Table (Sheet 5 of 6)

TROUBLE	PROBABLE CAUSE	REMEDY
Trace is vertically unstable when unit is vibrated or hit with the heel of the hand.	Microphonic tubes.	Check by substitution until the microphonic tubes are found.
Loss of vertical positioning.	Preamplifier not fully seated. One or more wires to the interconnecting plug disconnected.	Tighten mounting screw. Connect wire and resolder.
Preamplifier, Model No. 1823, AC position of AC-DC switch acts the same as DC.	C864 or C865 shorting S802 or S806.	Move C864 or C865, figure 6-10.

Figure 6-1. Trouble Shooting Table (Sheet 6 of 6)

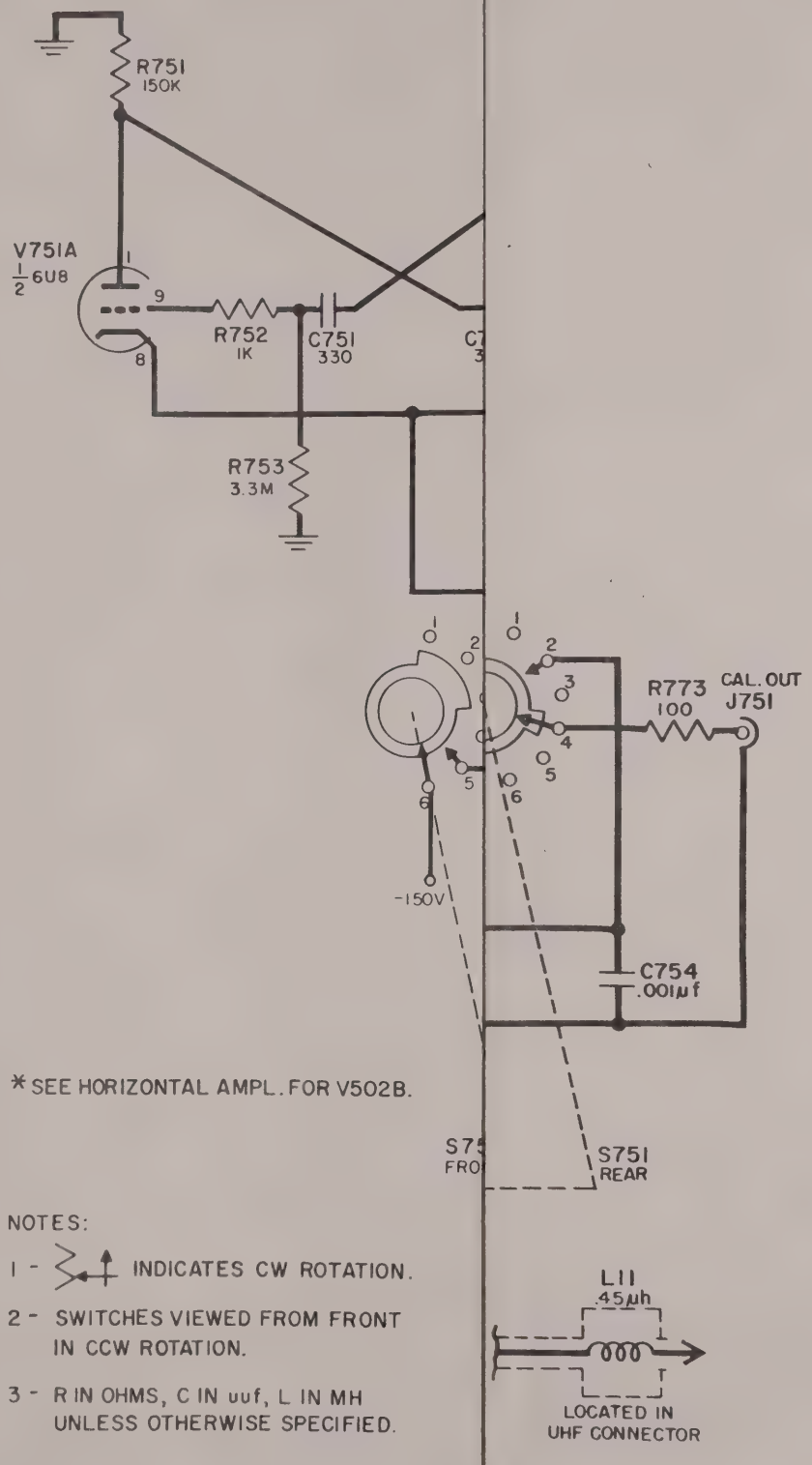


Figure 6-2. Schematic Dia

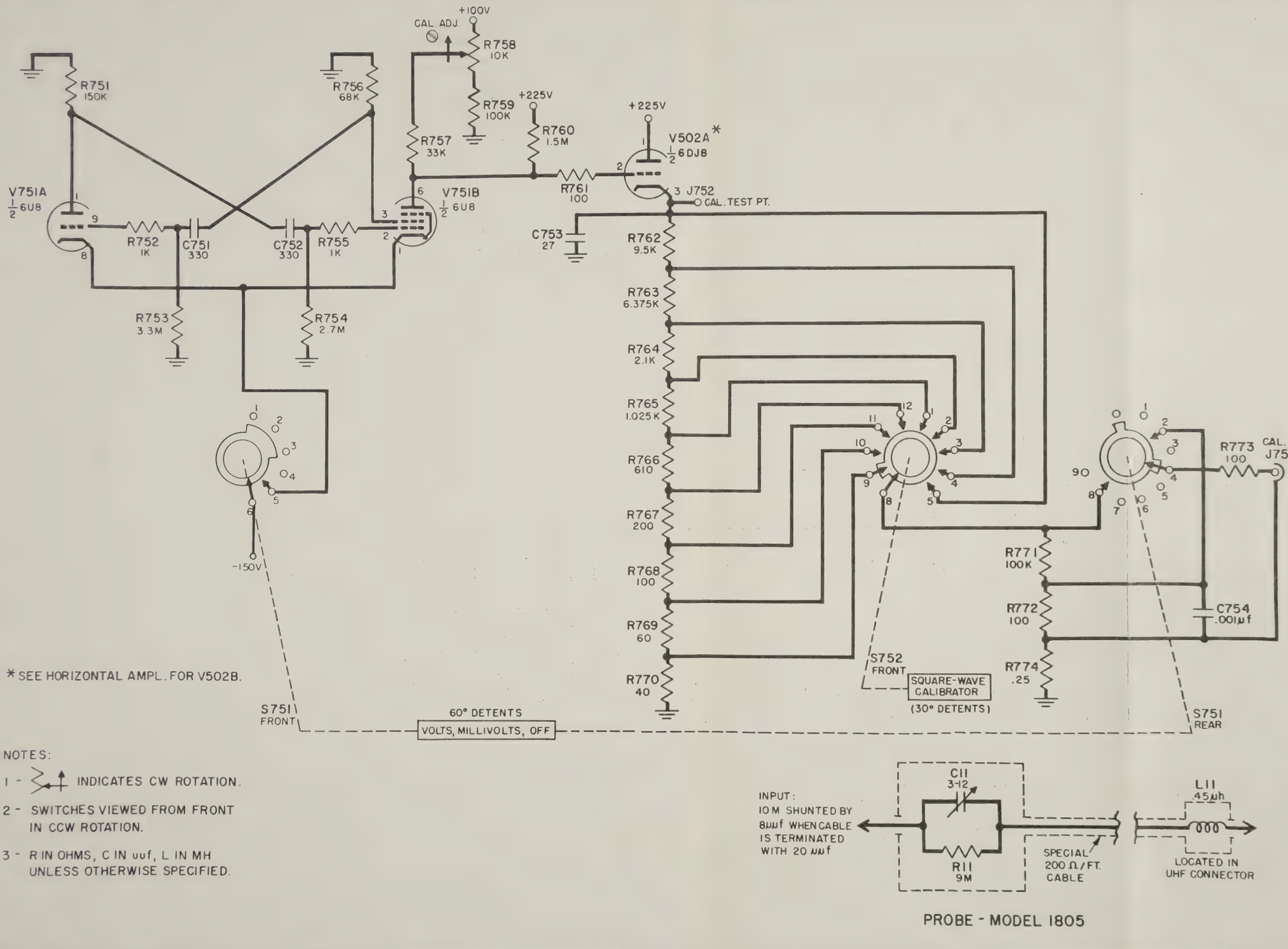


Figure 6-2. Schematic Diagram of Calibrator Probes

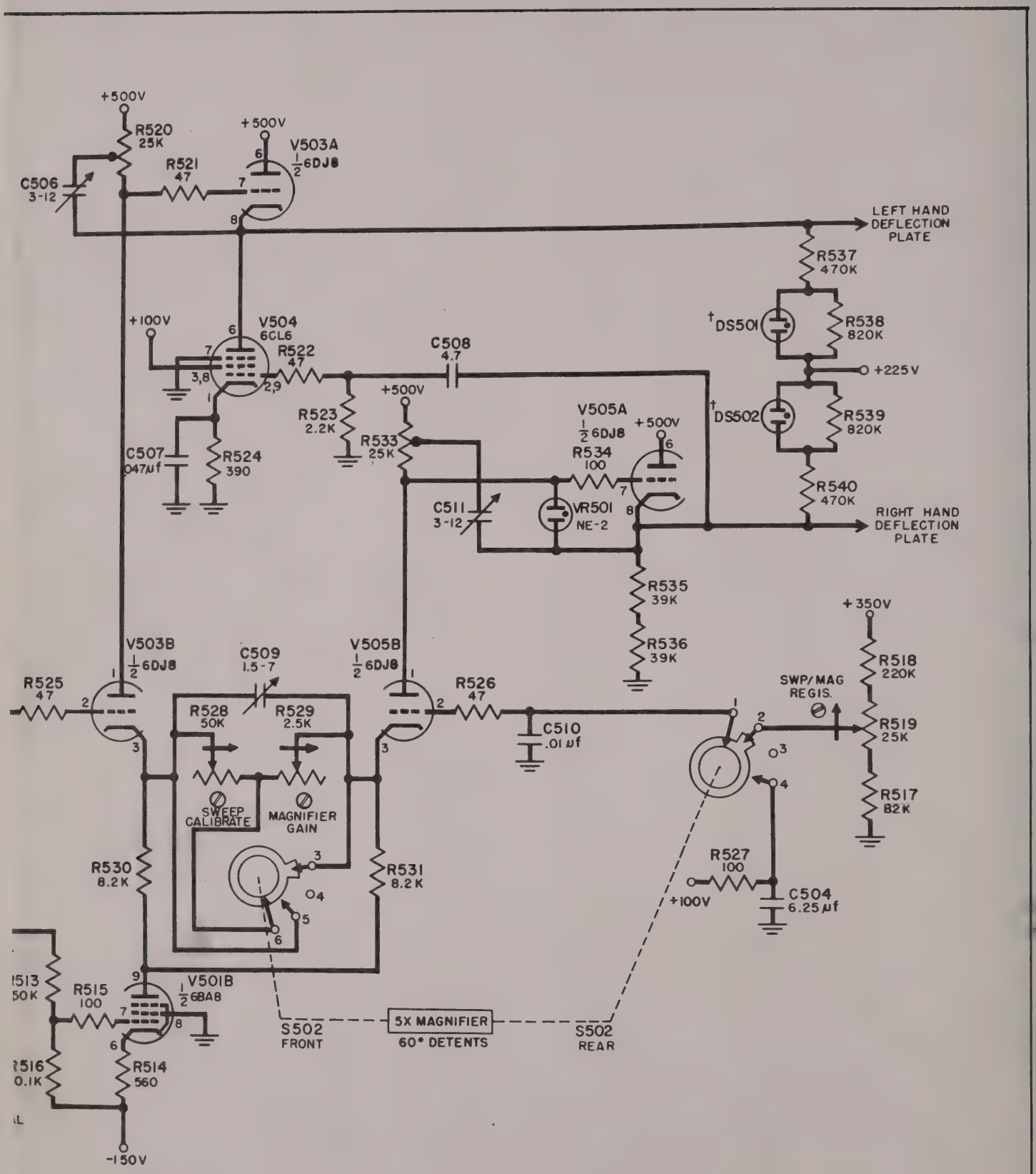


Figure 6-3. Schematic Diagram of Horizontal Amplifier

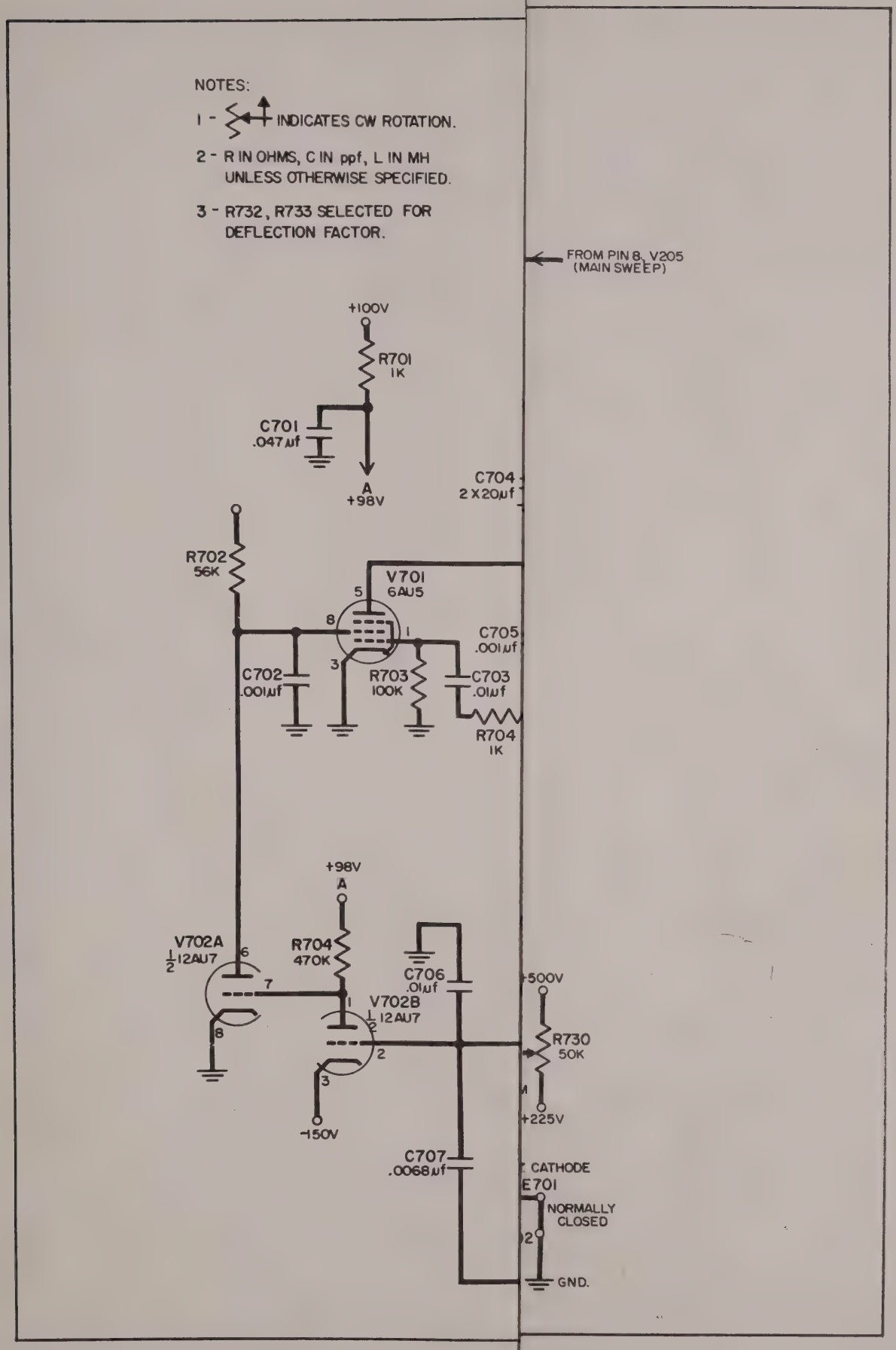


Figure 6-4. Schematic Diagram

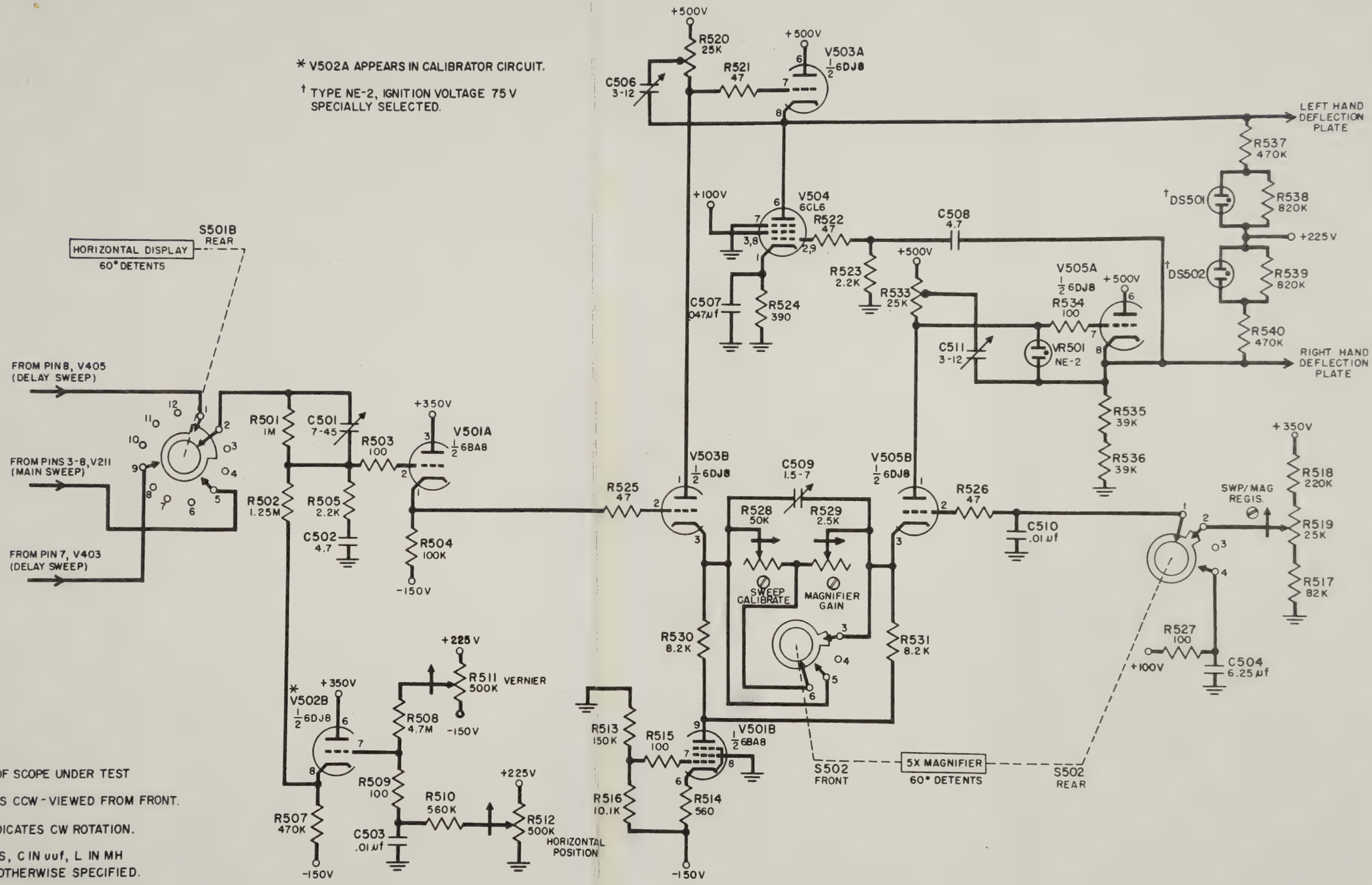


Figure 6-3. Schematic Diagram of Horizontal Amplifier

NOTES:

1 - ↻ INDICATES CW ROTATION.

2 - R IN OHMS, C IN ppf, L IN MH UNLESS OTHERWISE SPECIFIED.

3 - R732, R733 SELECTED FOR DEFLECTION FACTOR.

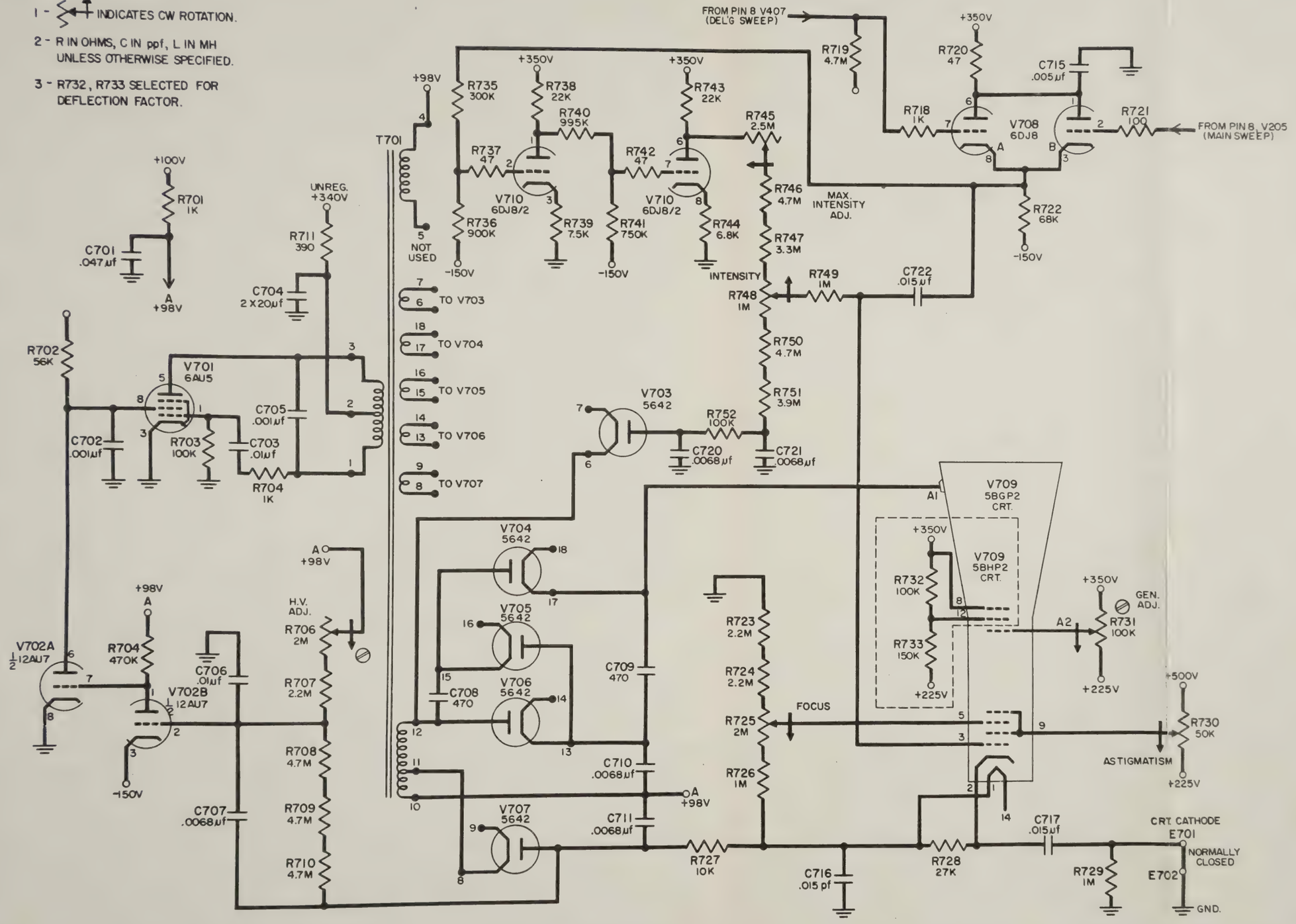
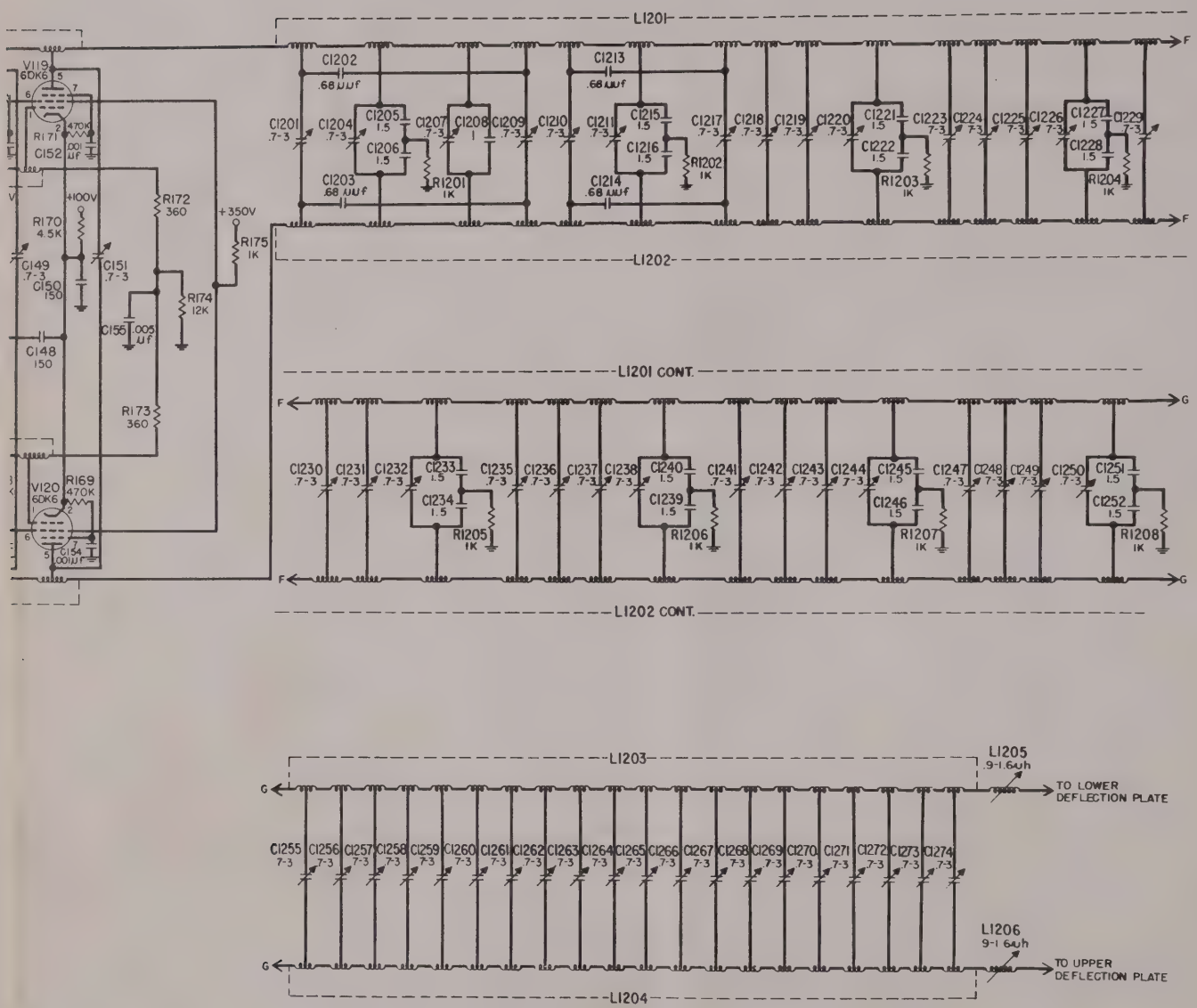


Figure 6-4. Schematic Diagram of Cathode-Ray Tube Circuits



uuf, L IN MH
NISE SPECIFIED.

DIRECTION OF CW ROTATION.

Figure 6-5. Schematic Diagram of Vertical Amplifier

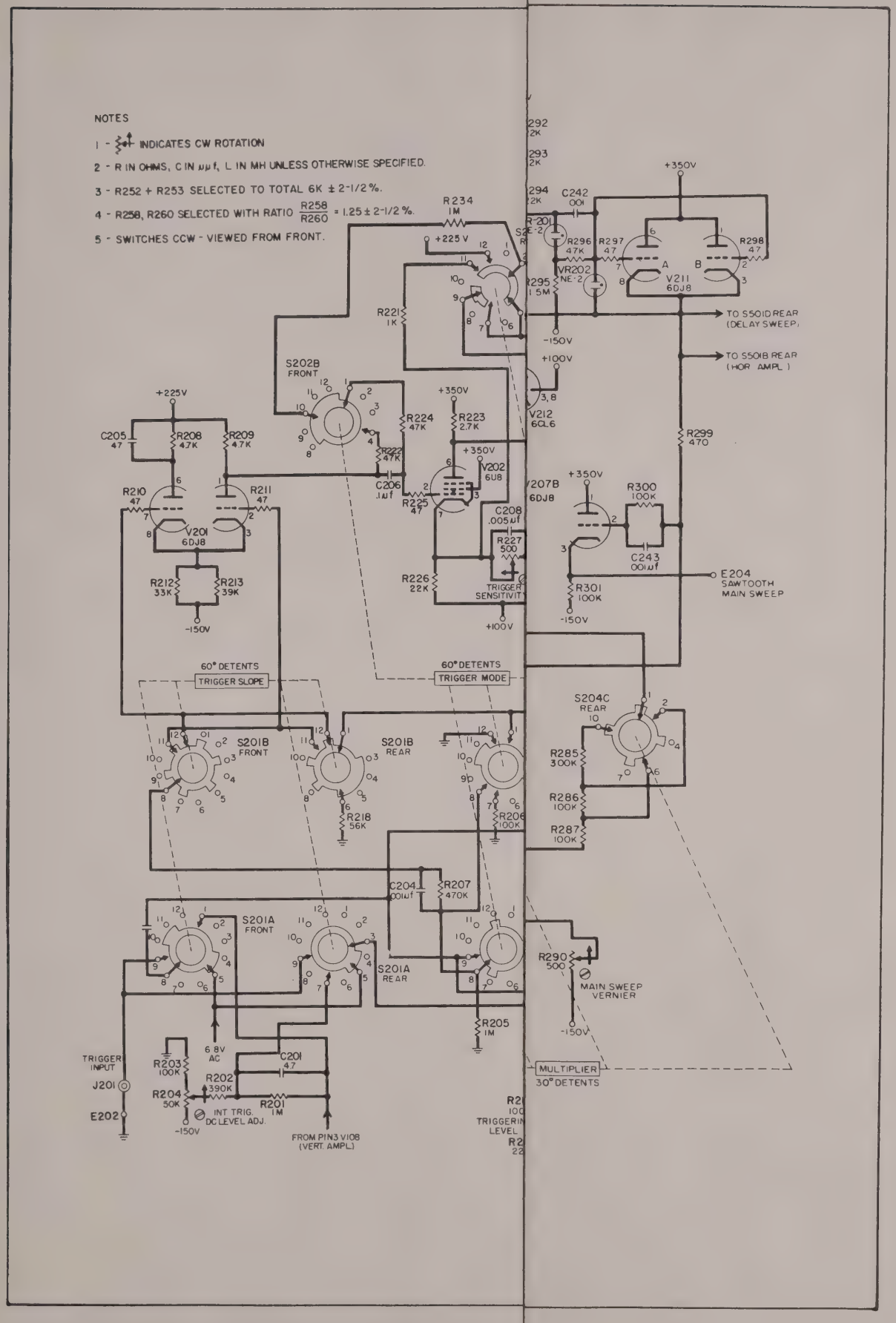
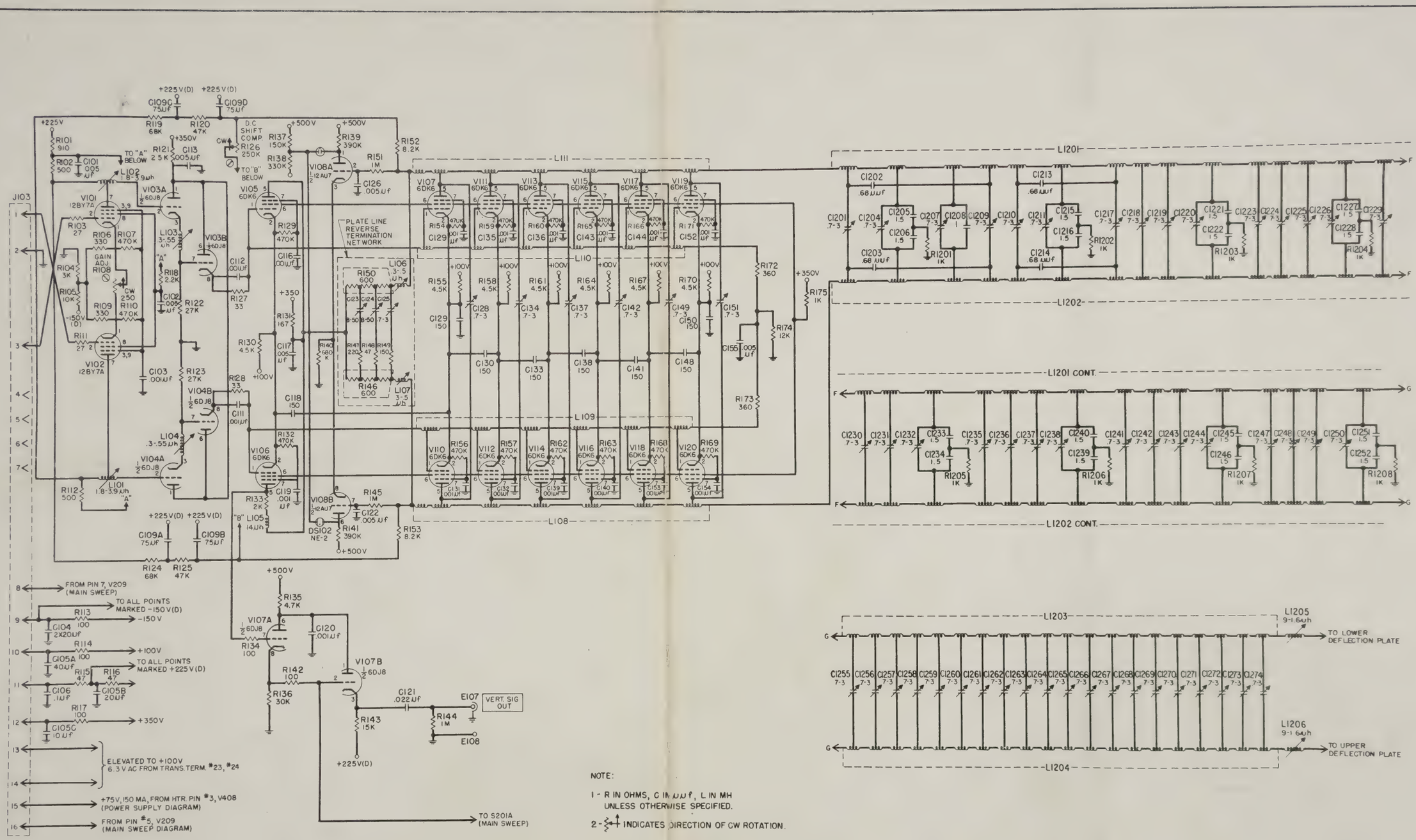


Figure 6-6. Schematic Diagram



NOTE:

1 - R IN OHMS, C IN μμf, L IN MH UNLESS OTHERWISE SPECIFIED.

2 - ↔ INDICATES DIRECTION OF CW ROTATION.

Figure 6-5. Schematic Diagram of Vertical Amplifier

NOTES

1 - ↻ INDICATES CW ROTATION.

2 - R IN OHMS, C IN μμf, L IN MH UNLESS OTHERWISE SPECIFIED

3 - R252 + R253 SELECTED TO TOTAL 6K ± 2-1/2%.

4 - R258, R260 SELECTED WITH RATIO $\frac{R258}{R260}$ = 1.25 ± 2-1/2%.

5 - SWITCHES CCW - VIEWED FROM FRONT.

Figure 6-6. Schematic Diagram of Main Sweep Generator

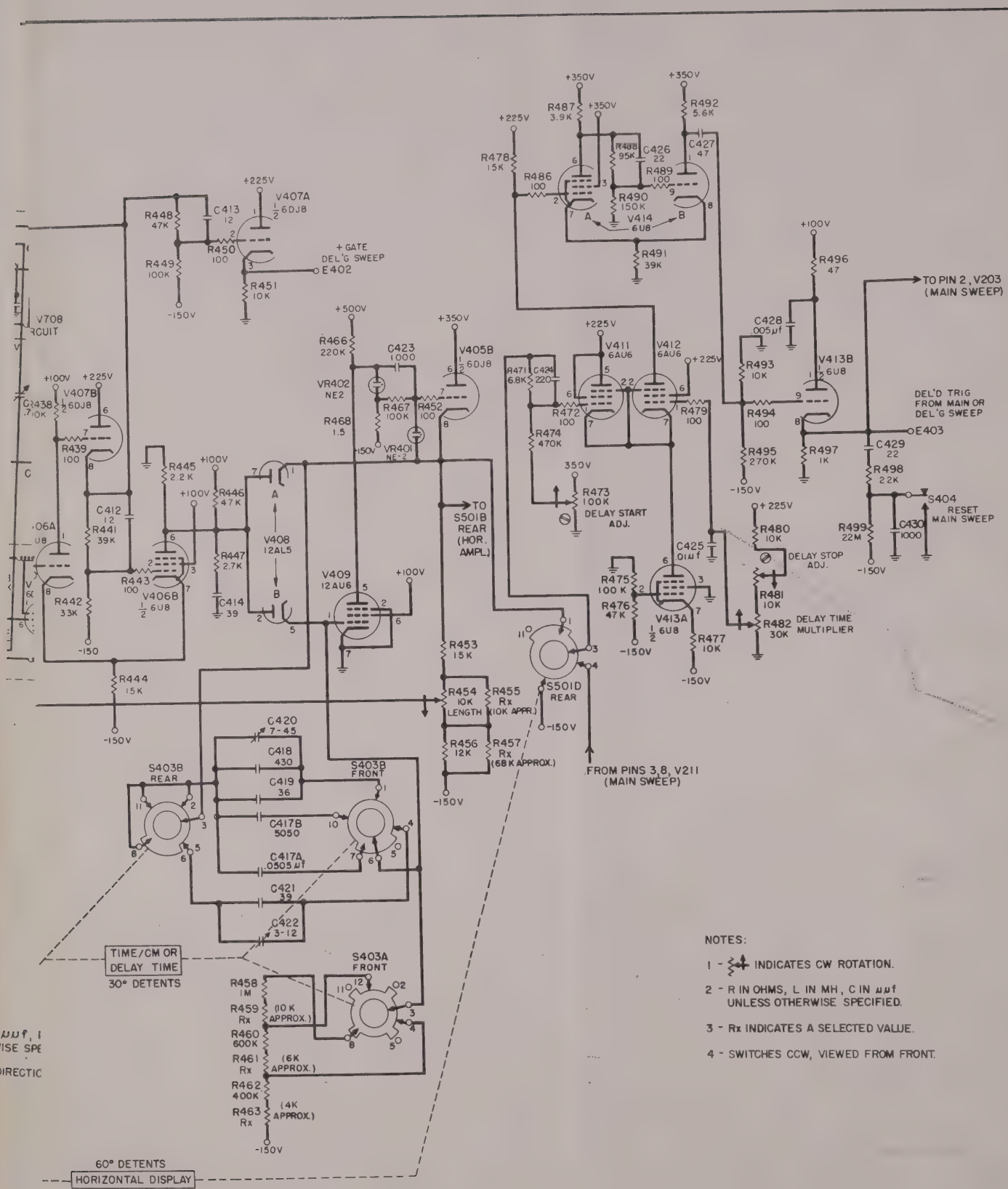


Figure 6-7. Schematic Diagram of Delay Sweep Generator

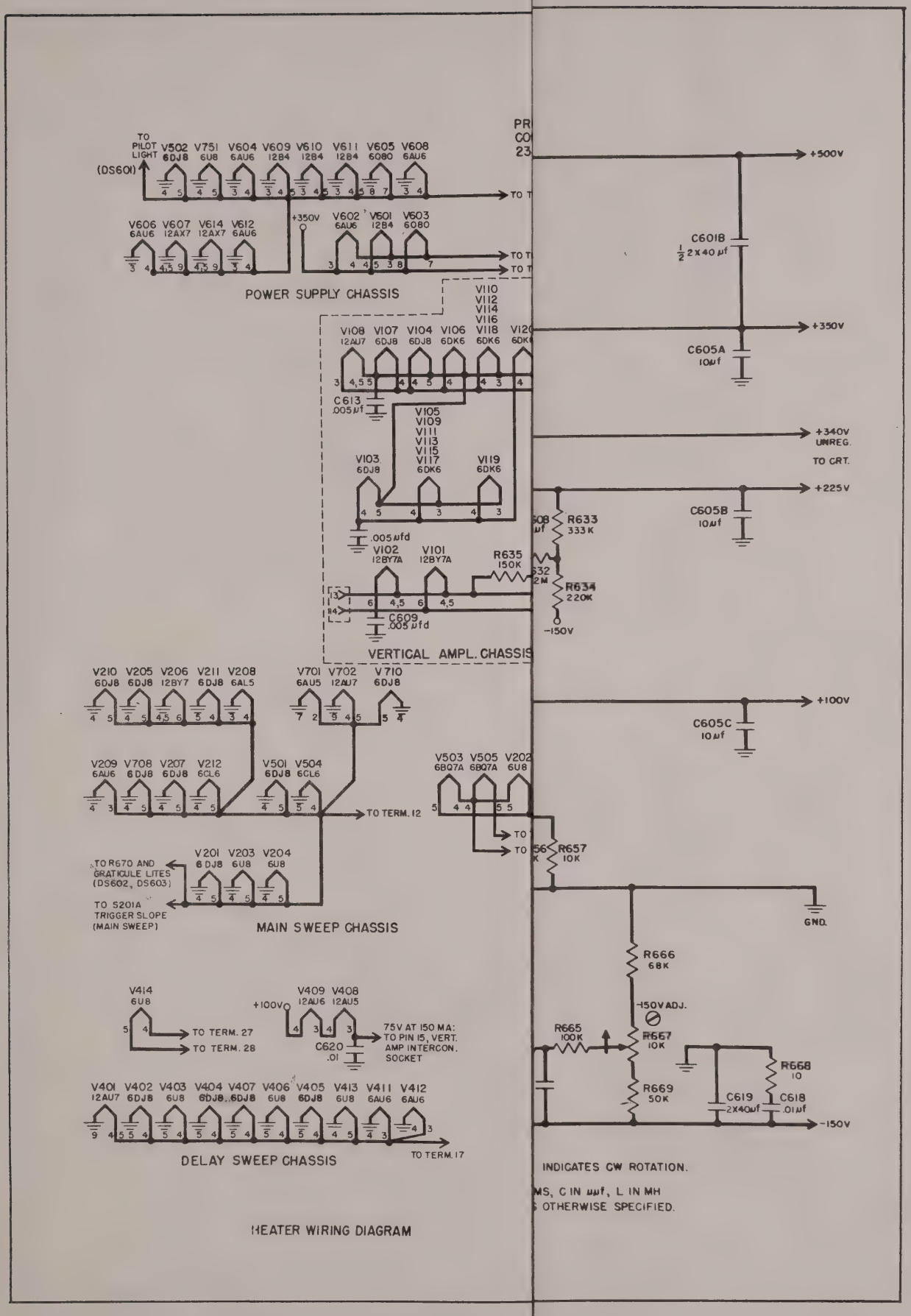


Figure 6-8. Schematic Diagram o

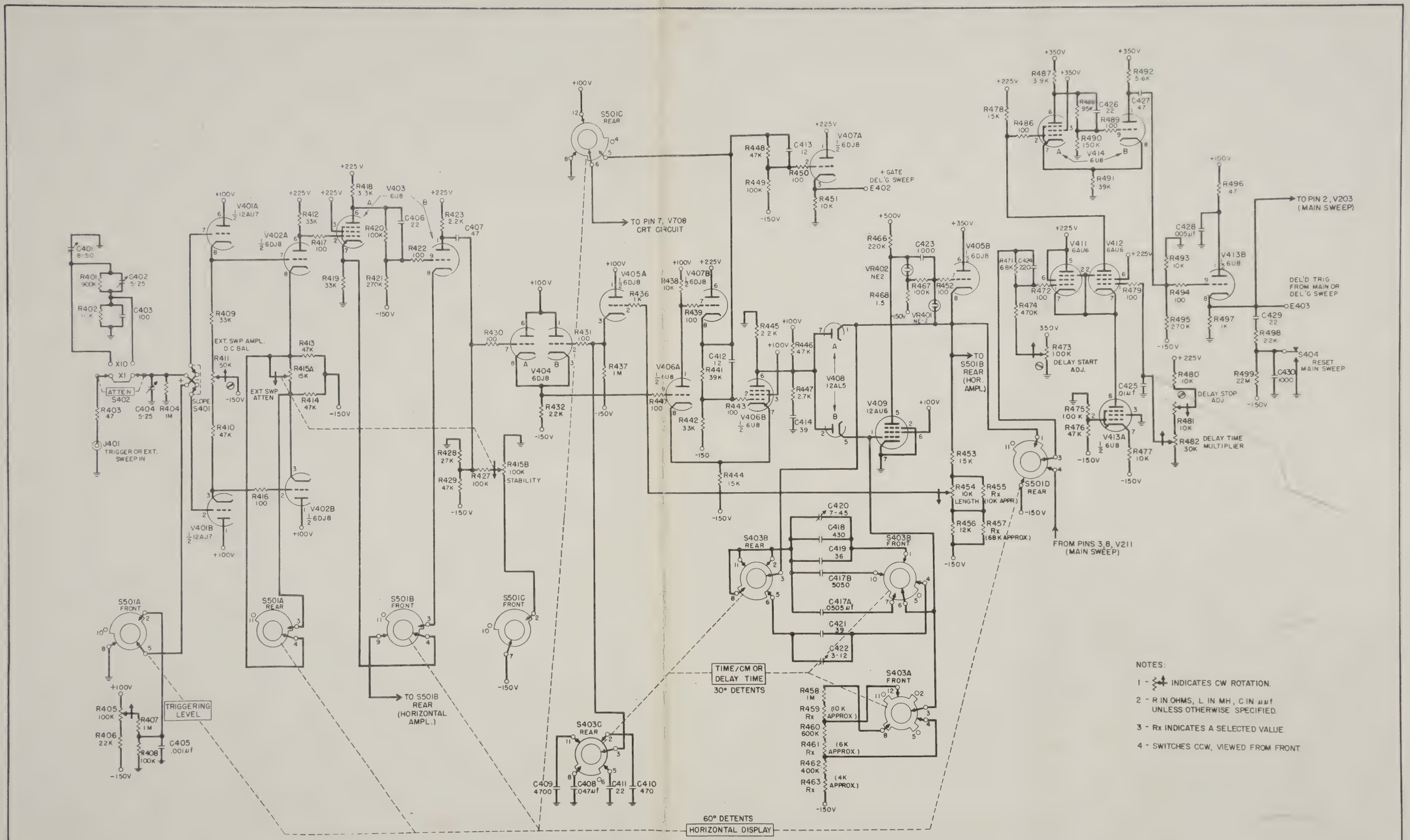

TO PIN 7, V708 CRT CIRCUIT
+GATE DEL'G SWEEP E402
TO PIN 2, V203 (MAIN SWEEP)
DEL'D TRIG FROM MAIN OR DEL'G SWEEP E403
RESET MAIN SWEEP S404
DELAY START ADJ.
DELAY STOP ADJ
DELAY TIME MULTIPLIER
TO S501B REAR (HOR. AMPL.)
FROM PINS 3,8, V211 (MAIN SWEEP)
EXT. SWP AMPL. D.C BAL
EXT. SWP ATTEN
SLOPE S401
ATTEN S402
TRIGGER OR EXT. SWEEP IN J401
STABILITY
TRIGGERING LEVEL
TO S501B REAR (HORIZONTAL AMPL.)
TIME/CM OR DELAY TIME 30° DETENTS
60° DETENTS HORIZONTAL DISPLAY
LENGTH
Rx (10K APPR.)
Rx (68K APPROX.)
(10K APPROX.)
(6K APPROX.)
(4K APPROX.)
NOTES:
1 - INDICATES CW ROTATION.
2 - R IN OHMS, L IN MH, C IN µµf UNLESS OTHERWISE SPECIFIED.
3 - Rx INDICATES A SELECTED VALUE.
4 - SWITCHES CCW, VIEWED FROM FRONT.

Figure 6-7. Schematic Diagram of Delay Sweep Generator

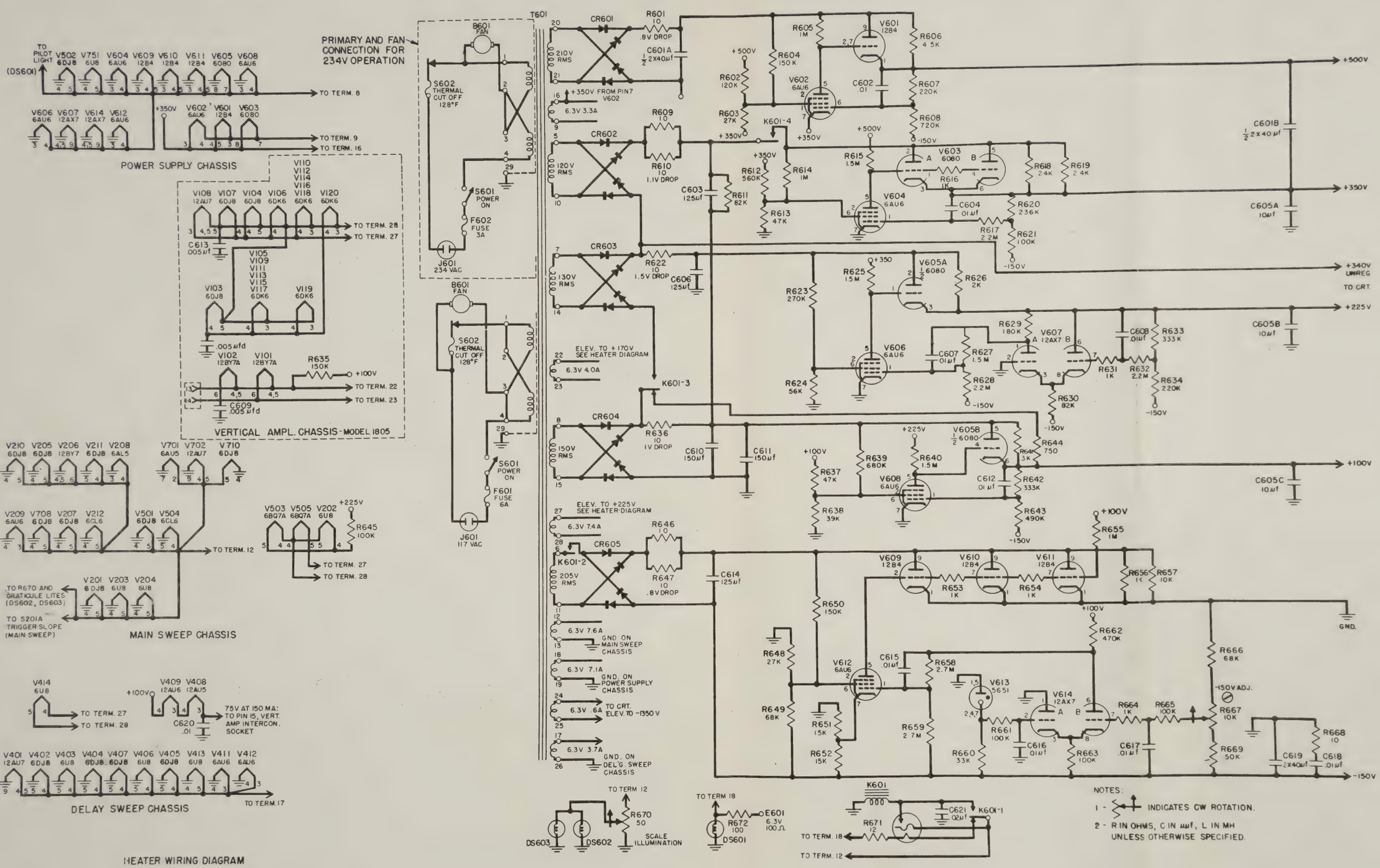


Figure 6-8. Schematic Diagram of Low Voltage Power Supply

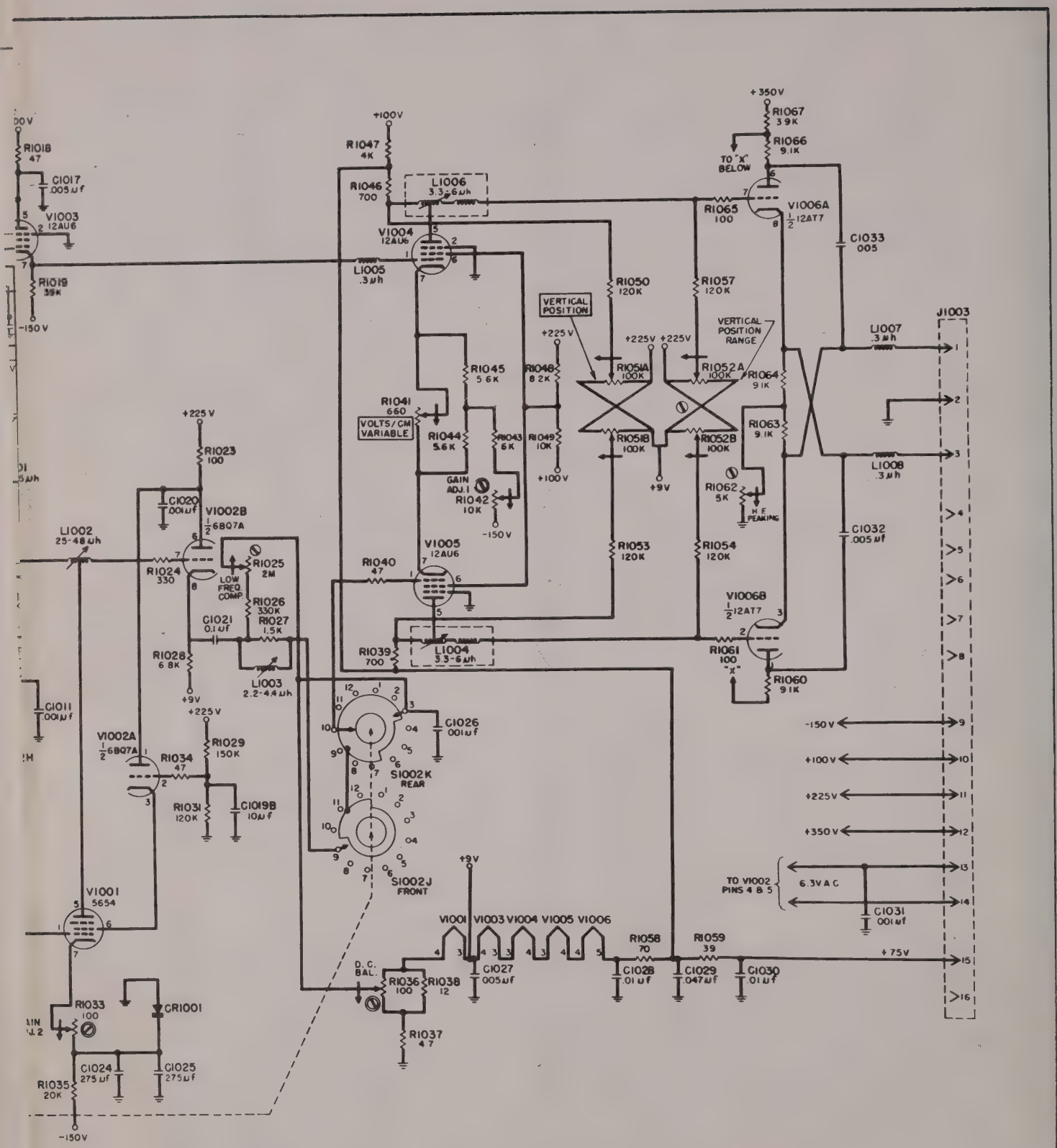


Figure 6-9. Schematic Diagram of Preamplifier, Model No. 1822

✓
schematic

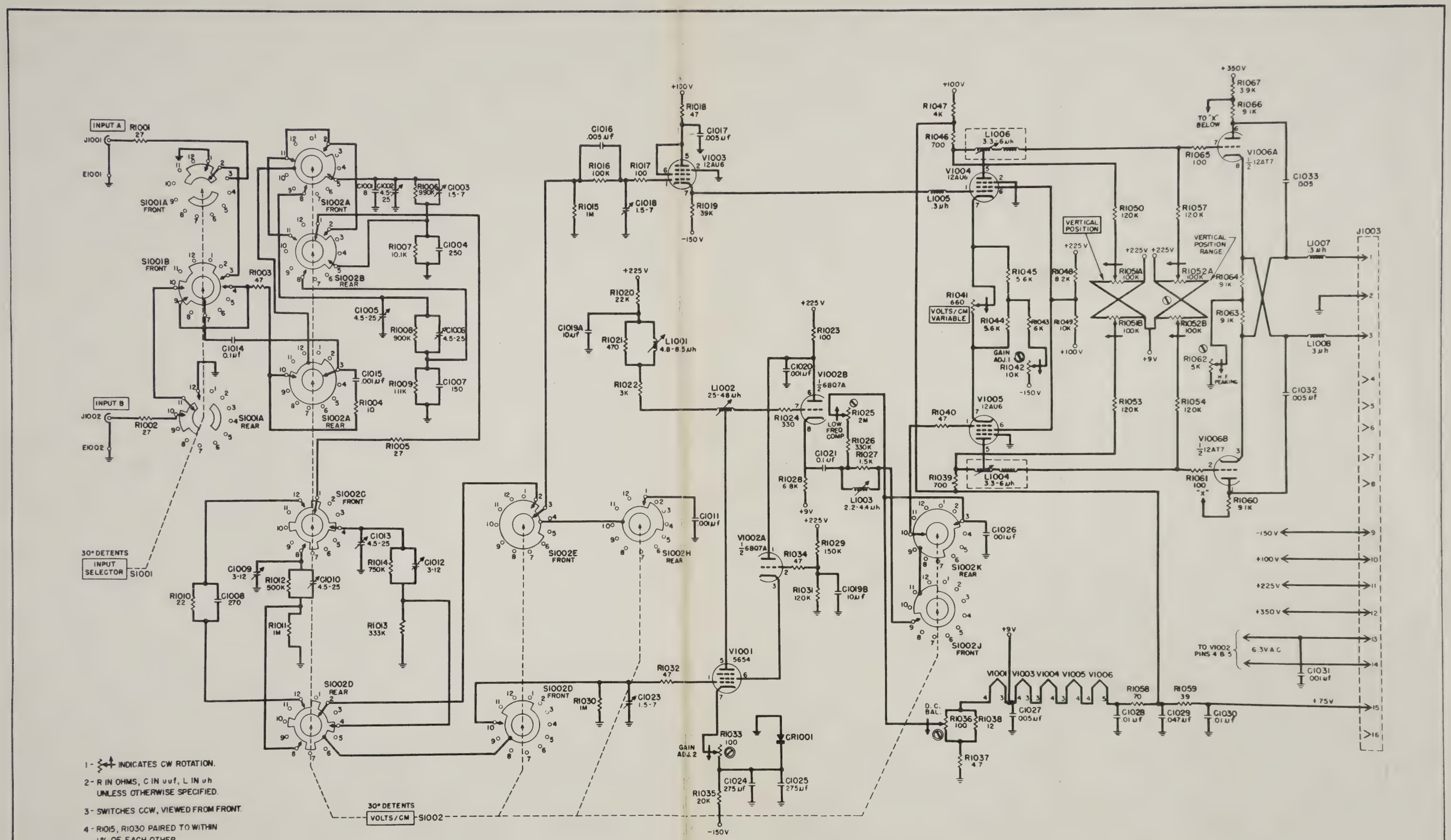


Figure 6-9. Schematic Diagram of Preamplifier, Model No. 1822

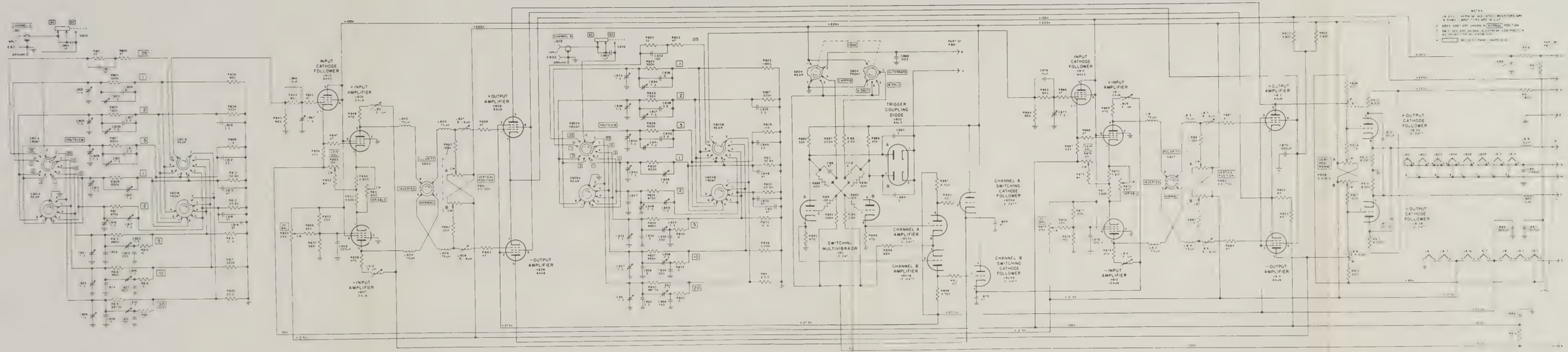
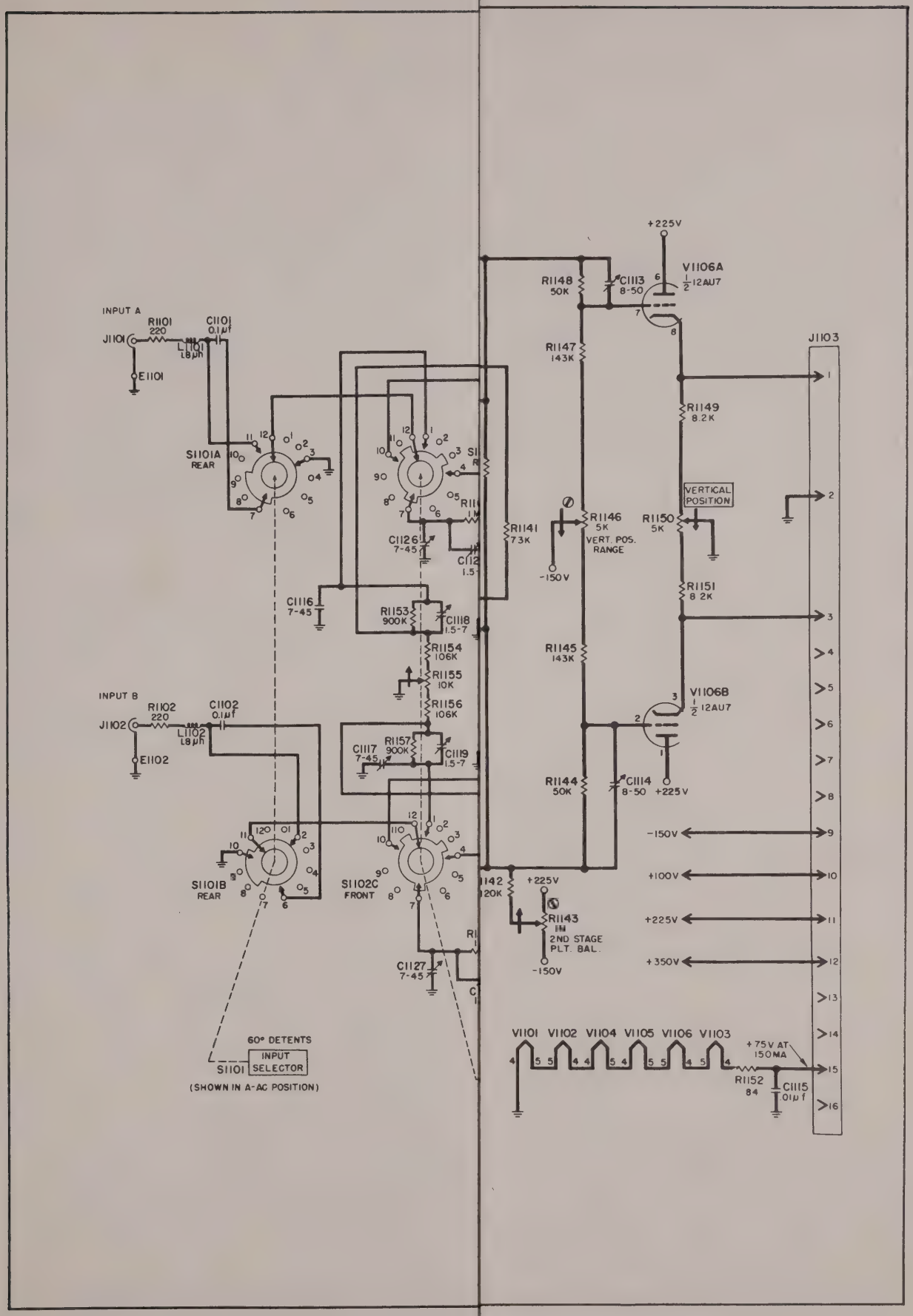


Figure 6-10. Schematic Diagram of Preamplifier, Model 1823


INPUT A
J1101
R1101 220
C1101 0.1μf
L1101 L8μh
E1101
S1101A REAR
INPUT B
J1102
R1102 220
C1102 0.1μf
L1102 L8μh
E1102
S1101B REAR
S1102C FRONT
60° DETENTS
INPUT SELECTOR
S1101
(SHOWN IN A-AC POSITION)
C1126 7-45
C1127 7-45
C1116 7-45
C1117 7-45
R1153 900K
C1118 1.5-7
R1154 106K
R1155 10K
R1156 106K
R1157 900K
C1119 1.5-7
R1141 73K
R1142 120K
R1143 1M 2ND STAGE PLT. BAL.
-150V
+225V
R1146 5K VERT. POS. RANGE
R1148 50K
C1113 8-50
V1106A 1/2 12AU7
R1147 143K
R1149 8.2K
VERTICAL POSITION
R1150 5K
R1151 8.2K
R1145 143K
V1106B 1/2 12AU7
R1144 50K
C1114 8-50
+225V
J1103
-150V
+100V
+225V
+350V
V1101 V1102 V1104 V1105 V1106 V1103
+75V AT 150MA
R1152 84
C1115 .01μf

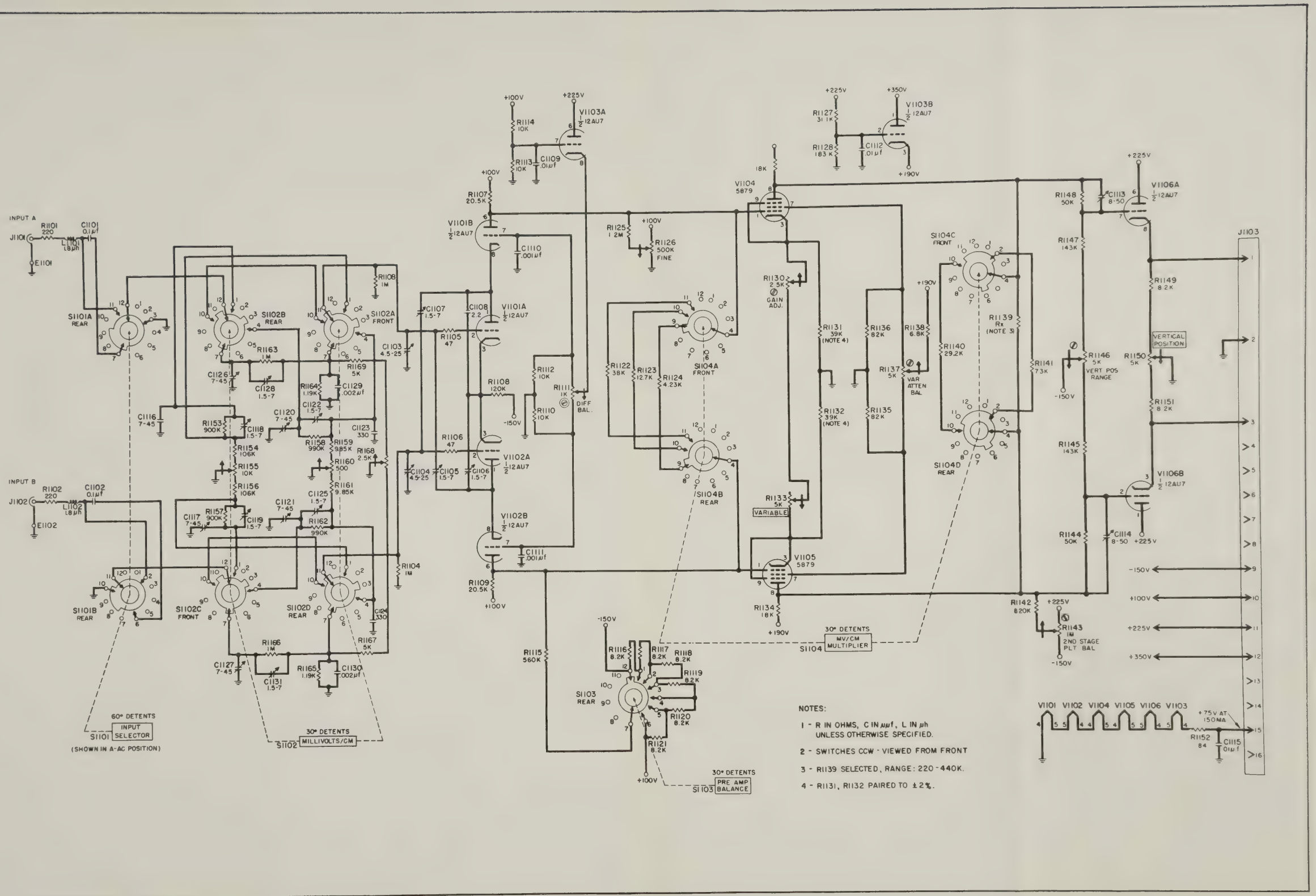


Figure 6-11. Schematic Diagram of Preamplifier, Model No. 1824

SECTION VII
CALIBRATION

7-1. CALIBRATION, OSCILLOSCOPE.

7-2. GENERAL. Values of various circuit elements will change after continued use of the oscilloscope due to temperature changes, vibration and to aging of tubes, dielectrics, etc. The calibrating procedures described in this section are, therefore, provided to restore the original accuracy of the instrument. Normally it will not be necessary to make all of these adjustments at any one time. However, any adjustments should be made in the sequence given below.

7-3. The equipment listed in figure 7-1 is necessary for a complete recalibration of the oscilloscope.

7-4. VOLTAGE CHECKS. Insert a preamplifier known to be accurately calibrated and turn on the oscilloscope. Allow unit to warm up for thirty minutes before making adjustments. Using a VOM (see figure 7-1) check voltages in accordance with the following instructions.

a. SET -150 ADJ. Check and adjust -150v supply for -150v ± 1% by using -150 ADJ potentiometer (1, figure 7-2). Check 100v, 225v, 350v and 500v supplies for their respective voltages ± 2%. Check at terminal strip (2) at rear of main sweep chassis.

b. SET CAL ADJ. Turn SQUARE WAVE CALIBRATOR to OFF. Adjust CAL ADJ potentiometer (3) for 100 ± 1v reading at the CAL TEST PT (4). Turn SQUARE WAVE CALIBRATOR to 100v output. Measure 100v output at calibrator CAL OUT connector to read 45 to 55v to test for square wave symmetry.

c. SET HV ADJ. Adjust HV ADJ control (5, figure 7-2) for -1350v. Insert probe through hole in high voltage shield (6) and read -1350v at front of the 27k resistor (see detail C, figure 7-2). This measurement can be made on the 1200v scale on the VOM by measuring with respect to -150v instead of ground.

d. SET MAX INTEN ADJ. Turn INTENSITY control ccw. Turn main sweep STABILITY control ccw but not to PRESET. Turn TRIGGER MODE switch to AC slow. HORIZONTAL DISPLAY switch to MAIN SWEEP NORMAL. Adjust MAX INTEN ADJ (8) so that positive end of INTENSITY control measures -1350v. Take measurement between test point shown in detail A. figure 7-2 and test point shown in detail C. Adjust for zero voltage.

7-5. With main sweep TIME/CM switch at one MILLISEC, advance STABILITY and INTENSITY controls and position the trace on the crt with the VERTICAL and HORIZONTAL POSITION controls.

7-6. SET GEOM ADJ. Insert a signal from the SQUARE WAVE CALIBRATOR so that only the rising and falling portions of the signal are visible within the scale. Adjust STABILITY and TRIGGERING LEVEL controls for a stable display. If necessary, adjust the TRIGGER SENSITIVITY (9) and/or TRIGGERING LEVEL CENTERING potentiometer (10) to obtain a stable display. Adjust GEOM ADJ (11) to obtain minimum curvature of the vertical traces. Display a 60cps raster and check to see that the horizontal and vertical edges of the raster do not depart from a straight line by more than two mm and one mm respectively.

7-7. SET VERTICAL GAIN ADJ. Place preamplifier VOLTS/CM switch to 20 and apply a 100v signal from SQUARE WAVE CALIBRATOR. Adjust AMP GAIN (12) for five cm of vertical deflection. Check 40 ohm resistor in SQUARE WAVE CALIBRATOR by switching SQUARE WAVE CALIBRATOR to .2. Set preamplifier VOLTS/CM switch to .05 and check for four cm vertical deflection. The preamplifier used must have a calibrated gain of two.

NOMENCLATURE	PART NUMBER OR MODEL	APPLICATION	RANGE	ACCURACY
VOLT-OHM-MILLIAMMETER (VOM)	Hickok 455A	Voltage checks	0 to 1200v	20000 ohms per volt, 3%
OSCILLOSCOPE	Tertronix Model 535	Set triggering level	0 to 10 mcs 50 mv to 20 v/cm	± 3%
TIME MARK GENERATOR	Tertronix Type 180A	Adjust SWEEP CAL	5 sec to 50 mcs	2 parts per million in 24 hours
SQUARE WAVE GENERATOR	Hickok 1715	Set input attenuators Adjust output compensation	1 cps to 1 mc	 rise time, 0.02 usec

Figure 7-1. Table of Auxiliary Calibration Test Equipment

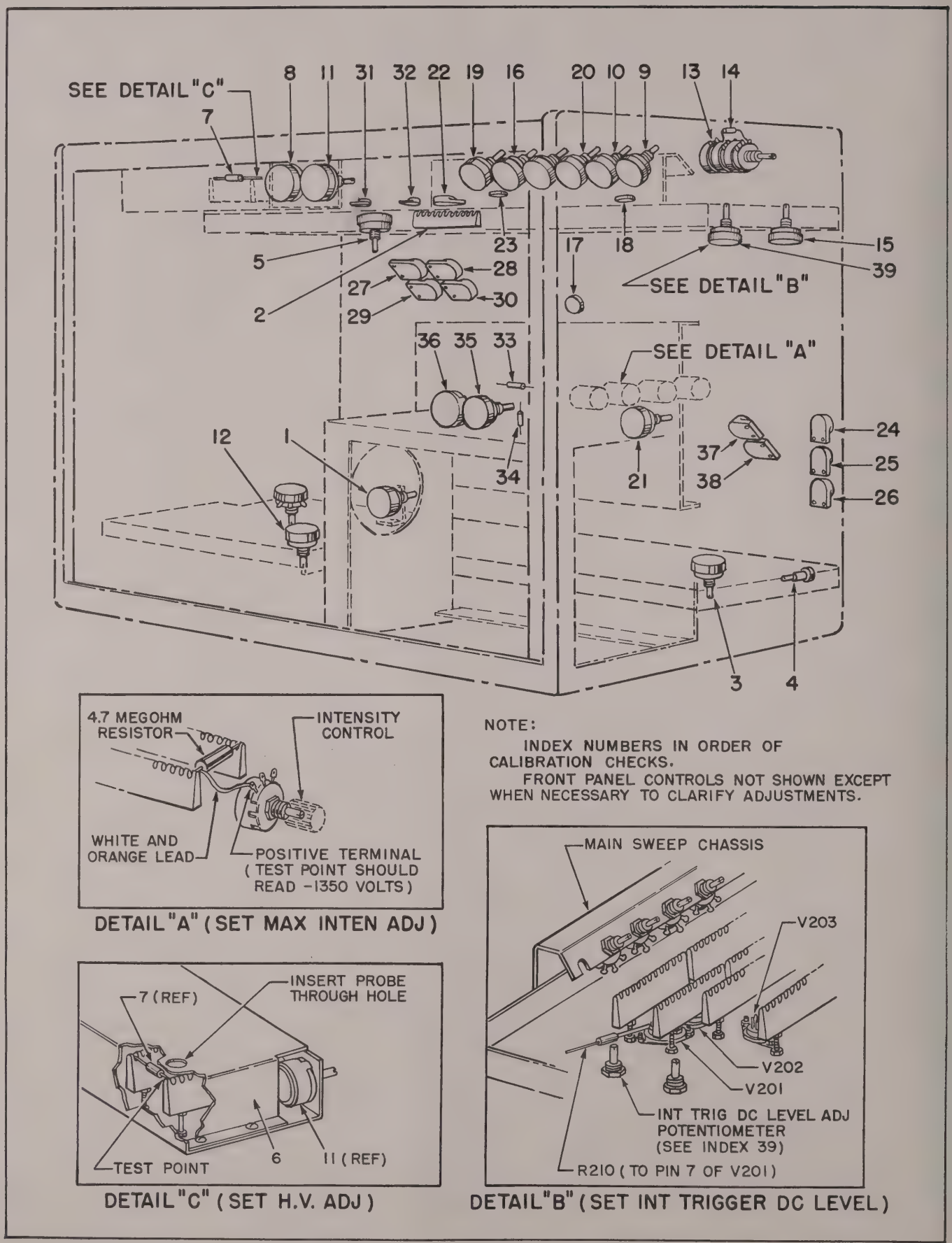


Figure 7-2. Calibration Check Points of Oscilloscope

LEGEND FOR FIGURE 7-2

1. -150 v ADJ Potentiometer
2. Ceramic Terminal Strip
3. CAL ADJ Potentiometer
4. CAL TEST PT Test Point
5. HV ADJ Potentiometer
6. High Voltage Shield
7. Resistor, 27k
8. MAX INTEN ADJ Potentiometer
9. TRIGGER SENSITIVITY Potentiometer
10. TRIGGERING LEVEL CENTERING Potentiometer
11. GEOM ADJ Potentiometer
12. AMP GAIN Potentiometer
13. TRIGGERING LEVEL Potentiometer
14. Resistor, 470k
15. PRESET STABILITY Potentiometer
16. SWEEP CALIBRATE Potentiometer
17. Variable Resistor, R290
18. Variable Resistor, R259
19. MAG GAIN Potentiometer
20. SWP/MAG REGIS Potentiometer
21. EXT SWP AMP DC BAL Potentiometer
22. Capacitor, C501
23. Trimmer Capacitor, C509
24. Capacitor, C404
25. Capacitor, C401
26. Capacitor, C402
27. Capacitor, C230
28. Capacitor, C232
29. Capacitor, C234
30. Capacitor, C235
31. Capacitor, C506
32. Capacitor, C511
33. Variable Resistor, R455
34. Variable Resistor, R457
35. DELAY START ADJ Potentiometer
36. DELAY STOP ADJ Potentiometer
37. Capacitor, C420
38. Capacitor, C422
39. INT TRIG DC LEVEL ADJ Potentiometer

7-8. SET TRIGGERING LEVEL CONTROL. Set the trigger controls to +, INT and DC. Set the TIME/CM switch to 100 usec and turn STABILITY full left, but not to PRESET. Set the auxiliary test oscilloscope (scope) TIME/CM switch to 0.05 DC. Set the TRIGGER MODE switch on LINE, AUTOMATIC and set the main sweep TIME/CM switch to one MILLISEC. Set MULTIPLIER on 2. Use a 10X probe properly adjusted. Center the trace on the test scope for zero reference. Loosen setscrew in knob on shaft of TRIGGERING LEVEL potentiometer (13). Connect probe to grid end of the 470k resistor (14) on arm of TRIGGERING LEVEL potentiometer (13). Set TRIGGERING LEVEL potentiometer to zero volts. Physically center knob on shaft and tighten setscrew in knob. Leave TRIGGERING LEVEL control at zero volts during succeeding adjustments.

7-9. SET INT TRIG DC LEVEL CONTROL. Position trace of the scope under calibration in the center of the scale. Re-check the test scope zero reference and connect the probe from test scope to R210 (see detail B, figure 7-2). This point should read zero volts. Switch scope under calibration from + INT to -INT and adjust INT TRIG DC LEVEL ADJ (see detail B) for zero volts on the test scope.

7-10. ADJUST TRIGGER LEVEL CENTERING. Set TRIGGERING MODE switch to AC SLOW and the TRIGGER SLOPE switch to + LINE. Switch test scope VOLTS/CM switch to 0.2 VOLTS/CM, AC. Connect probe from test scope to pin one of V202 (see detail B, figure 7-2) and adjust TRIGGERING LEVEL CENTERING potentiometer (10) so that the waveform on the test scope is symmetrical. For final adjustment, switch test scope MAGNIFIER to ON and horizontally center switching portions of the multi-waveform. Now switch the TRIGGER SLOPE switch of the scope under calibration back and forth from +LINE to -LINE and, at the same time, re-adjust TRIGGER LEVEL CENTERING potentiometer (10) until there is no shifting of the switching portion of the multi-waveform.

7-11. ADJUST TRIGGER SENSITIVITY. Turn the TRIGGER SENSITIVITY potentiometer (9) cw until oscillation occurs at the leading and trailing edges of the multi-waveform. (Test scope should remain as described in paragraph 7-10). Note the amplitude of the spike on the waveform just at the point of oscillation. Turn the TRIGGER SENSITIVITY potentiometer ccw until this spike is slightly less than one-half original size.

7-12. ADJUST PRESET STABILITY. Turn TRIGGERING MODE switch to AUTOMATIC, +LINE. Turn the PRESET STABILITY potentiometer (15) cw until the sweep triggers. The center arm of the potentiometer should read approximately -80v on the VOM (see figure 7-1). Continue turning PRESET STABILITY potentiometer until the sweep free-runs (trace will brighten). The center arm of the PRESET STABILITY potentiometer should now be approximately 15v to 25v higher (-95 v to -105v). Turn PRESET STABILITY potentiometer back until the VOM reads halfway between the two readings.

7-13. ADJUST SWEEP CAL. Using Time Marker Generator (see figure 7-1), apply one millisec time marks to INPUT connection. Turn HORIZONTAL DISPLAY to DELAYING SWEEP and delaying sweep TIME/CM switch to one MILLISEC. Use patchcord to jumper the TRIGGER OR EXT SWEEP IN to VERTICAL SIG OUT and adjust STABILITY and TRIGGERING LEVEL controls for a stable display. Adjust SWEEP CALIBRATE potentiometer (16) for one time-mark per cm. When any timing adjustments are made, always make them from the 1 cm line to the 9 cm line on the scale.

7-14. Turn TIME/CM OR DELAY TIME switch to 2 usec/cm. There will be two markers per centimeter. Note the deviation of the marker on the 9 cm line (if any). Readjust the SWEEP CALIBRATE potentiometer (16) for best compromise timing on both the 1 and 2 usec/cm ranges. LINEARITY TO BE ± 1%, TIMING TO BE ± 2% ON ALL MAIN SWEEP SPEEDS.

7-15. ADJUST MAIN-SWEEP TO DELAYING-SWEEP TIMING. Switch HORIZONTAL DISPLAY SWITCH TO MAIN SWEEP. Set main sweep TIME/CM switch at 100, 10 and 1 MILLISEC and adjust R290 (17) for best compromise timing. Use appropriate markers. (R290 is on the main sweep TIME/CM switch bracket.)

7-16. ADJUST R259. Set HORIZONTAL DISPLAY switch on MAIN SWEEP DELAYED. Set delaying sweep STABILITY full right. Set main sweep TIME/CM switch to 100 usec. Turn the main sweep STABILITY control until a trace first appears. Connect test scope through a 10X probe to pin 8 of V203 (see detail B) and observe a composite sawtooth and gate waveform. Adjust R259 (18)to the point where the sawtooth portion of the waveform is about two-thirds of the amplitude of the gate portion. The gate portion of the waveform must be at least 9 v in amplitude. Each time the setting of R259 is changed, readjust the main sweep STABILITY control or an erroneous adjustment of R259 will result.

7-17. Adjust main sweep LENGTH control for approximately 10.2 to 10.5 cm of horizontal sweep.

7-18. ADJUST MAG GAIN. Turn main sweep TIME/CM switch to 1 MILLISEC and insert 1 millisec and 100 usec markers from the time mark generator (see figure 7-1). Turn MAGNIFIER ON and adjust MAG GAIN (19) for 5X magnification (one large mark every 5 cm and two small marks every cm). Check magnifier linearity over the entire sweep length.

7-19. ADJUST SWP/MAG REGIS. With MAGNIFIER ON, position the trace so that the first time mark falls on the center line of the scale. Turn MAGNIFIER OFF and adjust SWP MAG/REGIS potentiometer (20) so that the first time mark falls on the centerline of the scale. Check to see that the MAG ON and MAG OFF positions register properly in the middle and at the end of the sweep.

7-20. ADJUST EXT SWP AMPL DC BAL. Connect SAWTOOTH MAIN SWEEP into vertical INPUT and place HORIZONTAL DISPLAY switch to EXT SWEEP. Adjust EXT SWP AMPL DC BAL (21) for no horizontal shift of vertical trace when rotating STABILITY or EXT SWEEP ATTEN control.

7-21. ADJUST EXT SWEEP AMP COMP. Apply a fast rise square wave (about 2kc) to EXT SWP IN. With MAGNIFIER ON, externally trigger sweep. Adjust C501(22)(this will be a long time-constant compensation) for optimum square-wave response. Turn MAGNIFIER OFF. Now connect the square wave through the capacity standardizer (see following note) into EXT SWP IN connector. With the ATTEN toggle switch in X1 position, adjust C404 (24) for optimum flat top. To adjust EXT SWEEP 10X ATTEN compensation, disconnect the capacity standardizer and connect square wave generator to EXT SWP IN connector. Adjust capacitor C402 (26) for flat top. Reconnect capacity standardizer and adjust C401 (25) for flat top.

NOTE

Capacity standardizer referred to in text consists of a one megohm, 1/2 watt, ten percent resistor in parallel with a capacitor the value of which depends upon the application. When adjusting the EXT SWEEP AMP COMP potentiometer, use a 47 uuf, one percent capacitor. When making preamplifier input capacity adjustments, use a 20 uuf, one percent capacitor. When using capacity standardizer feed signal through components to scope.

7-22. Check the main sweep rates as tabulated in figure 7-3.

7-23. SET DELAYING SWEEP LENGTH. Place HORIZONTAL DISPLAY switch to DELAYING SWEEP, TIME/CM to 500 usec. R455 (33, figure 7-2) (usually 12 k to 18 k) shunts the length control. R457 (34) (usually 47 k to 68 k) shunts the 12 k resistor between the SWEEP LENGTH potentiometer and -150 v. Lengths shall be 10.3 to 10.8 and 3.2 to 3.8 cm.

TIME/CM	MULTIPLIER	TIME MARK GEN	ACTION	INDEX NO. Fig. 7-2
100 usec	X1	100 usec	Adjust C230	27
100 usec	X2	100 usec	Check MULTIPLIER	
100 usec	X5	1 millisec	Check MULTIPLIER	
10 usec	X1	10 usec	Adjust C232	28
1 usec	X1	1 usec	Adjust C234	29
1 usec	X2	1 usec	Check MULTIPLIER	
1 usec	X5	5 usec	Check MULTIPLIER	
0.1 usec	X5	1 usec	Adjust C235	30
0.1 usec	X1	10 mcs	Adjust C509*	23
0.1 usec	5X MAG ON	50 mcs**	Adjust C506 and C511	31 and 32

*Adjust for linearity.

**There will be interaction between the linearity adjustment of C509 and the timing adjustments of C234 and C235 so that it will be necessary to perform these steps over again until the timing is correct.

Figure 7-3. Table of Main Sweep Speed Rates and Adjustments

DELAY SWEEP TIME/CM	TIME MARK GEN	HORIZONTAL DISPLAY	MAIN SWEEP TIME/CM	ACTION	INDEX NO. Fig. 7-2
50 usec	50 usec	Main Sweep Delayed*	1 usec	Adjust C420	37
5 usec	5 usec	Main Sweep Delayed	1 usec	Adjust C422	38
*Make rough adjustments in DELAYING SWEEP position of HORIZONTAL DISPLAY switch, then go to MAIN SWEEP DELAYED position.					

Figure 7-4. Table of Delaying Sweep Speed Rates and Adjustments

7-24. SET DELAY START ADJ and DELAY STOP ADJ. From the time-mark generator feed 500 usec marks to the TRIGGER INPUT connector. Trigger the DELAYING SWEEP by feeding from VERT SIG OUT with a patch-cord into TRIGGER OR EXT SWEEP IN connector. Adjust STABILITY AND TRIGGERING LEVEL for a stable sweep. Turn main sweep STABILITY full right to free-run sweep. Check DELAY-TIME MULTIPLIER dial for mechanical zero. By turning the DELAY-TIME MULTIPLIER dial for mechanical zero. By turning the DELAY-TIME MULTIPLIER a brightened portion of the sweep can be moved along the trace. The size of this brightened portion depends on the MAIN SWEEP speed. Turn the DELAY-TIME MULTIPLIER to 1.00. Adjust DELAY START ADJ potentiometer (35) until the brightened portion just reaches the first time mark. Turn the MULTIPLIER to 9.00 and adjust DELAY STOP ADJ potentiometer (36) so that the brightened spot searches the ninth time mark. There will be interaction between these adjustments, so it will be necessary to go back and forth several times. Adjust so that the difference of the two readings is 8.00 ± 0. Place HORIZONTAL DISPLAY switch in MAIN SWEEP DELAYED and make final adjustments. Check linearity of the DELAY-TIME MULTIPLIER at all major divisions. It shall be within ± 2 minor helidial divisions of the previous reading.

7-25. Adjust delaying sweep rates as tabulated in figure 7-4.

7-26. CALIBRATION, PREAMPLIFIER MODEL NO. 1822.

7-27. ADJUST DC BAL and GAIN ADJUST. Adjust the preamplifier DC BAL and GAIN ADJUST potentiometer as described in paragraphs 4-10 and 4-11.

7-28. ADJUST VERT POS RANGE CONTROL. Center the VERTICAL POSITION control. Adjust the VERT POS RANGE control (see figure 7-6) until trace is centered on the crt screen.

7-29. ADJUST INPUT CAPACITANCE. Adjust capacitance of preamplifier in the unattenuated position as described below:

a. Connect 47 uuf capacitance standardizer to INPUT A.

b. Set VOLTS/CM switch to 0.05.

c. Connect the output of the square wave generator to the capacitance standardizer.

d. Set the square wave generator to one kc and view five or six cycles on the screen.

e. Adjust C1018 (see figure 7-6) for a flat top on the square wave.

7-30. ADJUST ATTENUATOR COMPENSATION. Remove the capacitance standardizer and connect the square wave generator to INPUT A. Set the VOLTS/CM switch in the positions listed below and adjust the listed capacitors for a square corner on the square wave.

VOLTS/CM	CAPACITOR (see figure 7-6)
0.1	C1010
0.2	C1012
0.5	C1006
5	C1003

Figure 7-5. Table of Attenuator Compensation Adjustments

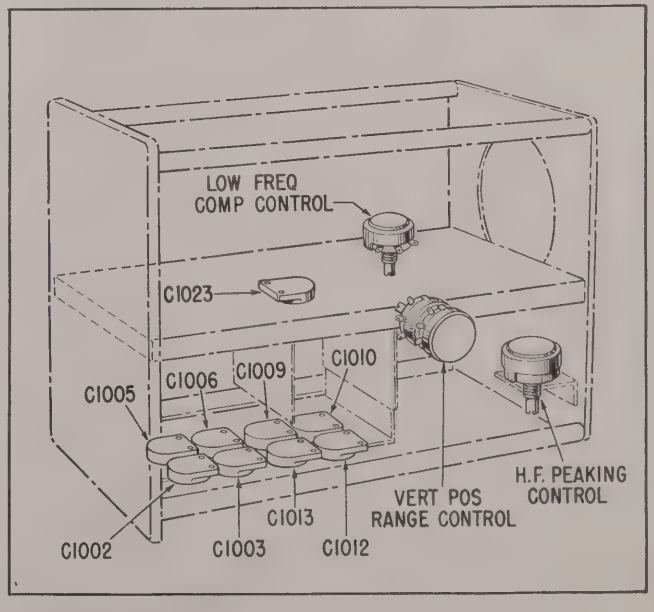


Figure 7-6. Calibration Check Points of Preamplifier Model No. 1822

7-31. ADJUST ATTENUATOR INPUT CAPACITANCE. Reconnect the capacitance standardizer to INPUT A and connect the square wave generator output to the capacitance standardizer. Adjust the capacitors listed in figure 7-7 for a flat top on the square wave.

VOLTS/CM	CAPACITOR (see figure 7-6)
0.005	C1023
0.1	C1009
0.2	C1013
0.5	C1005
5	C1002

Figure 7-7. Table of Attenuation Input Capacitance Adjustments

7-32. ADJUST LOW FREQUENCY COMPENSATION. Connect the probe to INPUT A. Set the VOLTS/CM switch to 0.02. Apply a 50 cycle square wave from the square wave generator to the probe. Adjust the LOW FREQ COMP control (see figure 7-6) for a flat top square wave.

7-33. CALIBRATION, PREAMPLIFIER MODEL NO. 1823.

7-34. Set DC balance for each channel. Rotate variable control while adjusting balance control for no vertical trace shift. (Balance control to be within ± 90° of its mid-range.) Using ALTERNATE, rotate both vertical position knobs to center of rotation. Adjust VERT POS RANGE control (see figure 7-8) until both traces are within the scale and centered about its center.

7-35. SET GAIN ADJUST. Aging of the tubes will affect the gain of the preamplifier. Display a calibrator waveform of 0.2v peak to peak with the VOLTS/CM switch in the 0.05 position. With GAIN ADJ control (see figure 7-8) fully cw, there should be at least 4.4cm deflection. Adjust GAIN ADJ control until the displayed waveform is 4 cm in height. Make sure the VARIABLE control is turned full right to the CALIBRATED position before making this adjustment. Repeat for Channel B.

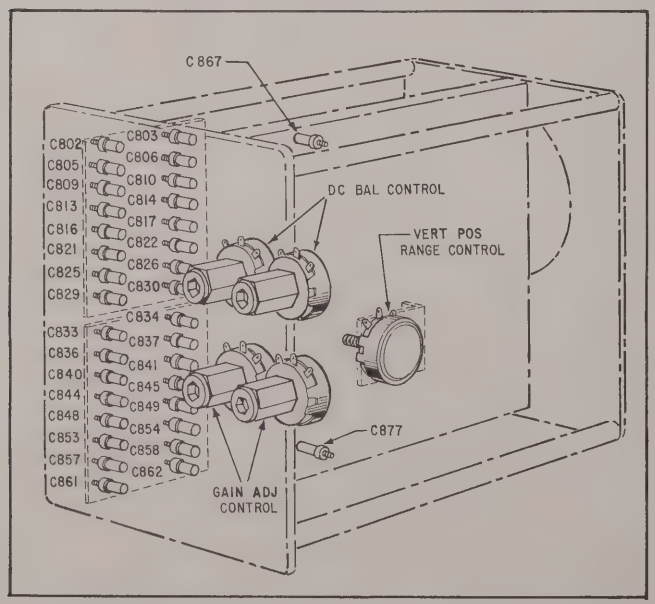


Figure 7-8. Calibration Check Points for Preamplifier, Model No. 1823

7-36. COMPENSATE A CHANNEL ATTENUATORS. Connect the capacitance standardizer to the CHANNEL A input connector and connect the square-wave source to the 20 uuf capacitance standardizer. Display four or five cycles of a one kc square wave. Set the VOLTS/CM switch to 0.05 and adjust C867 (see figure 7-8) for a flat top on the square wave. Remove the capactance standardizer and connect the square wave source to the input connector. Adjust the capacitors in figure 7-9 for a square corner on the square wave.

VOLTS/CM (CHANNEL A)	CAPACITOR (see figure 7-8)
.1	C803
.2	C806
.5	C810
1	C814
2	C817
5	C822
10	C826
20	C830
VOLTS/CM (CHANNEL B)	
.1	C834
.2	C837
.5	C841
1	C845
2	C849
5	C854
10	C858
20	C862

Figure 7-9. Table of Input Attenuator Compensation Adjustments

7-37. ADJUST INPUT CAPACITANCE. Connect the 20uuf capacitance standardizer to CHANNEL A input connector and connect the square wave source to the capacitance standardizer. Adjust the input capacitance with the VOLTS/CM switch in the positions shown in figure 7-10.

VOLTS/CM (CHANNEL A)	CAPACITOR (see figure 7-8)
.1	C802
.2	C805
.5	C809
1	C813
2	C816
5	C821
10	C825
20	C829
VOLTS/CM (CHANNEL B)	
.1	C833
.2	C836
.5	C840
1	C844
2	C848
5	C853
10	C857
20	C861

Figure 7-10. Table of Input Capacitance Adjustments

7-38. Move the square wave source to the channel B input connector with the 20 uuf capacitance standardizer in place and adjust C877 (see figure 7-8) for a flat top on the square wave. The VOLTS/CM switch should be in 0.05 position. Repeat the operations described in paragraphs 7-36 and 7-37 with the B channel amplifier.

7-39. CALIBRATION, PREAMPLIFIER MODEL NO. 1824.

7-40. ADJUST DIFF BAL. Adjust the preamplifier DIFF BAL control as described in paragraph 4-14.

7-41. POSITIONING ADJUST. Place a jumper from the plate (pin 8) of V1104 to the plate (pin 8) of the V1105 (see figure 7-11). Center the VERTICAL POSITION control and adjust the VERT POS RANGE (see figure 7-11) to center the trace vertically.

7-42. SECOND STAGE DC BALANCE. Remove the jumper from the plates of V1104 and V1105 and connect it between their grids (pin 1). Rotate the VARIABLE control and if the trace shifts position vertically, adjust the VAR ATTEN BAL control (see figure 7-11) until the trace does not shift as the VARIABLE control is rotated.

a. If the trace cannot be centered after the VAR ATTEN BAL adjustment, adjust the 2ND STAGE PLATE BAL control (see figure 7-11) to center the trace. Now rotate the variable control and see if the trace shifts position. If it does, readjust the VAR ATTEN BAL potentiometer until the trace no longer shifts.

b. Rotate the MV/CM MULTIPLIER control between 1 and 5; and if the trace shifts, readjust the 2ND STAGE PLATE BAL until the trace does not move as the MV/CM MULTIPLIER is rotated. Remove jumper before proceeding with calibration.

7-43. OUTPUT DIVIDER COMPENSATION. Connect the square wave generator output to INPUT A and proceed as follows:

a. Turn the input selector switch to A, DC.

b. Turn the MILLIVOLTS/CM switch to 1 and the MV/CM MULTIPLIER to 50.

c. Set the square wave generator (see figure 7-1) to 100 kcs and display 5 to 10 square waves. Adjust C1113 and C1114 (see figure 7-11) for a flat top and a square corner on the square wave.

7-44. INPUT A CAPACITANCE ADJUSTMENT. Connect the 47 uuf capacity standardizer to input A and proceed as follows:

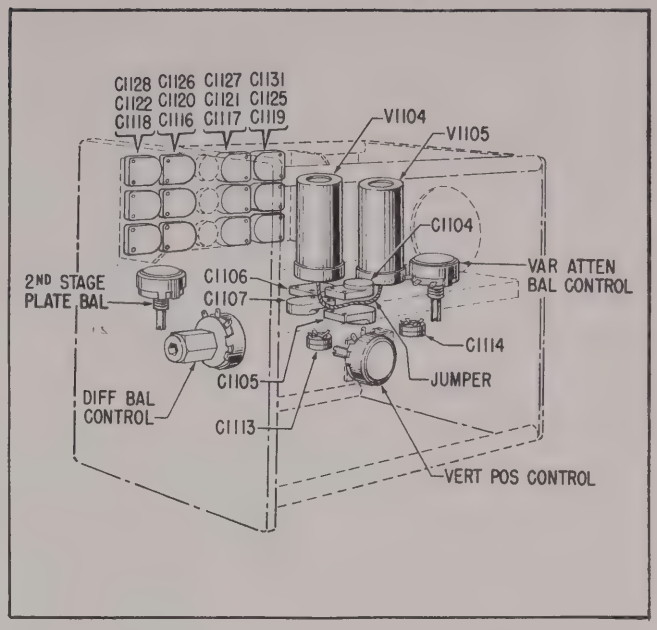


Figure 7-11. Calibration Check Points for Preamplifier, Model No. 1824

a. Connect the square wave generator (see figure 7-1) to the capacitance standardizer and apply a one kilocycle signal.

b. Turn the input selector switch to A, DC.

c. Turn the MILLIVOLTS/CM switch to 1 and the MV/CM MULTIPLIER to 50.

d. Adjust C1106 (see figure 7-11) for a flat top on the square wave.

7-45. INPUT B CAPACITANCE ADJUSTMENT. Connect the capacitance standardizer to INPUT B and proceed as follows:

a. Turn the input selector switch to B, DC.

b. Adjust C1105 (see figure 7-11) for a flat bottom on the square wave.

7-46. INPUT CAPACITANCE NEUTRALIZATION. Remove the capacitance standardizer and connect the square wave generator to INPUT A. Turn the input selector switch to A-B, DC and proceed as follows:

a. Adjust C1107 (see figure 7-11) for a flat top on the square wave.

b. Connect the square wave generator to input B and adjust C1104 for a flat bottom on the square wave.

c. Repeat steps outlined in paragraphs 7-44 and 7-45;

and if there is considerable change, it may be necessary to repeat steps in paragraph 7-46 as there is interaction between these adjustments.

7-47. INPUT A ATTENUATOR COMPENSATION. Connect the 47 uuf capacitance standardizer to INPUT A and connect the output from the square wave generator to the probe. Turn the input selector switch to A, DC. Adjust the capacitors in figure 7-12 for a flat top and a square corner on the square wave.

7-48. INPUT B ATTENUATOR COMPENSATION. Connect the 47 uuf capacitance standardizer to the INPUT B. Turn the input selector switch to B, DC and adjust the input B capacitors listed in figure 7-12 for a square corner on the square wave.

MILLIVOLTS/CM	CAPACITOR (see figure 7-11)
(Input A)	
1000	C1131 C1127
100	C1125 C1121
10	C1119 C1117
(Input B)	
1000	C1128 C1126
100	C1122 C1120
10	C1118 C1116

Figure 7-12. Table of Attenuator Compensation Adjustments

ADDENDUM SHEET

INSTRUCTIONS AND PARTS LIST

For

HICKOK OSCILLOSCOPE MODEL 1805A

NOTE

The following corrections and

additions should be included

in Section II of the above publication.

PAGE NO.	INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
2-1	A201	19915-555	SWITCH ASSEMBLY, Time Base "A" Trigger, includes rotary switch S201 and the following electrical components: C201, C202, C203, C204, C206, R203, R204, R205, R206, R207, R215, R216, R222, R223, R228, R237, R238, and R240. (28569)	
2-1	A202	19910-140	SWITCH ASSEMBLY, RESET, includes push button switch S202 and C266 (28569)	
2-1	A301	19915-557	SWITCH ASSEMBLY, Time Base "A" Timing, includes rotary switch S301 and the following electrical components: C351, C352, C353, C354, C358, C360, C361, C362, C363, C364, R351, R352, R353, R355, R356, R357, R360, R361, R362, R363, R364, R365, R366, R367, R368, R370, and R371. (28569)	
2-1	A401	19915-556	SWITCH ASSEMBLY, Time Base "B" Trigger, includes rotary switch S401 and the following electrical components: C401, C402, C403, C404, R400, R401, R403, R404, R405, R406, R413, R414, and R430. (28569)	
2-1	A430	19915-558	SWITCH ASSEMBLY, Time Base "B" Timing, includes rotary switch S430 and the following electrical components: C432, C433, C434, C435, C436, C441, C442, C443, R432, R433, R434, R435, R436, R437, R438, and R495. (28569)	
2-1	A751	19915-554	SWITCH ASSEMBLY, Voltage Calibrator, includes rotary switch S751 and the following electrical components: C754, R762, R763, R764, R765, R766, R767, R768, R769, R770, R771, R772, and R773. (28569)	
2-1	A852	19915-560	SWITCH ASSEMBLY, Horizontal Display (rear) includes rotary switch S852 and the following electrical components: C857, C859, R861, and R862. (28569)	
2-1	A853	19915-559	SWITCH ASSEMBLY, Horizontal Display (front) includes rotary switch S853 and the following electrical components: C802, C803, C806, C852, C859, R296, R329, R687, R801, R802, R803, and R804. (28569)	
2-1	C106	3105-266	Capacitor - Fixed, paper, .1uf, 20%, 400 V., tubular, (Sprague Difilm Black Beauty No. 109P10404, 1/2 in. x 1-1/2 in. or equal)	2-3

PAGE NO.	INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
2-6	C264	3110-172	Capacitor - Fixed, ceramic, 3.3uuf± 0.25uuf, 500V., tubular, (type CC22CJ3R3C per MIL-C-20D)	2-7
2-7	C276	3110-184	Capacitor - Fixed, ceramic, 10uuf, 500 V., (Erie No. GP1A10±1.0uuf or equal)	
2-7	C355	3105-361	Capacitor - Assy	2-17
2-8	C364	3115-23	Capacitor - Variable, ceramic, 3-12uuf, 20%, 500 V., (Erie type No. 503-27 (or TS2A) NPO3-12uuf or equal)	2-8
2-9	C432	3105-359	Capacitor - Fixed, paper, .1uf, 10%, 400V, tubular (Sprague Difilm Black Beauty No. 160P10494, 1/2 in. x 1-1/2 in. or equal)	2-10
2-9	C433		Same as C432	2-10
2-10	C452		Same as C276	2-15
2-11	C455		Not assigned	
2-21	CR401	3870-69	Diode-Silicon, 1N281 Sylvania (or equal)	
2-21	CR402	3870-100	Diode-Silicon, 1N458A Sylvania (or equal)	
2-21	CR601	3870-101	Diode-Silicon, SC6, 600 PIV, 1 Amp (or equal)	2-22
2-22	CR617	3870-102	Diode-Silicon, No. 10B1, 100 PIV, International Rectifier, (or equal)	
2-22	CR618		Same as CR617	
2-22	CR619		Same as CR617	
2-22	CR620		Same as CR617	
2-22	DS601	12270-12	Lamp - No. 47 G.E. radio panel, 6-8V, 0.15 Amp, miniature bayonet base	2-26
2-22	F105	6900-41	Fuse - 150 MA, 250 V, (Littlefuse 3AG pigtail)	2-3
2-22	F602	6900-52	Fuse - 6.25 Amp, (Littlefuse No. 3136.25 SLO-BLO or equal)	
2-24	R102	18530-221	Resistor - Fixed, film, 499 ohms, 1%, 1/2 Watt, (Electra type DC1/2A or equal)	2-3
2-27	R176	18423-562	Resistor - Fixed, composition, 56K ohms, 10%, 1 Watt, (Allen Bradley Part No. GB 5631)	2-3
2-30	R233	18530-106	Resistor - Fixed, film, 25.5K ohms, 1%, 1/2 Watt, (Electra type DC1/2A or equal)	2-6
2-30	R238	18431-431	Resistor - Fixed, composition, 43K ohms, 5%, 1/2 Watt, (Allen Bradley Part No. EB4335)	
2-30	R240	18530-175	Resistor - Fixed, film, 68K ohms, 1%, 1/2 Watt, (Electra type DC1/2A or equal)	
2-31	R266	18412-472	Resistor - Fixed, composition, 4700 ohms, 10%, 1/2 Watt, (Allen Bradley Part No. EB4721)	2-7
2-31	R272		Same as R233	2-6

PAGE NO.	INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
2-31	R277	18575-438	Resistor - Fixed, wire wound, 11K ohms, 5%, 3 Watt, (Dalohm type CS-2B or equal)	2-6
2-33	R300	40101-202	Resistor - Variable, composition, 2000 ohms, 20%, 2 Watt, (Allen Bradley type J)	2-7
2-35	R342	18525-852	Resistor - Fixed, composition, 3.9 ohms, 5%, 1/2 Watt, (Allen Bradley type EB)	
2-35	R343		Same as R342	
2-35	R360	16925-465	Resistor - Variable, composition, 1000 ohms, 10%, 0.5 Watt, (Chicago Telephone type 65 or equal)	2-9
2-35	R361		Same as R176	
2-36	R408	16925-461	Resistor - Variable, composition, 500 ohms, 10%, 0.5 Watt, (Chicago Telephone type 65 or equal)	2-11 & 2-15
2-36	R411	18575-399	Resistor - Fixed, wire wound, 40 K ohms, 3%, 5 Watt	2-15
2-36	R419		Same as R360	2-11 & 2-14
2-37	R429	18433-332	Resistor - Fixed, composition, 33 K ohms, 10%, 2 Watt, (Allen Bradley Part No. HB 3331)	2-15
2-37	R431		Same as R115	
2-39	R495	40101-103	Resistor - Variable, composition, 10,000 ohms, 20%, 2 Watt (Allen Bradley type J or equal)	2-13
2-39	R497		Resistor - Fixed, selected to center sweep	2-15
2-39	R498		Resistor - Fixed, selected to center sweep	2-15
2-41	R606	18575-427	Resistor - Fixed, wire wound, 4500 ohms, 5%, 10 Watt, (Ward Leonard Part No. 10F4500 or equal)	2-21
2-44	R667	16925-357	Resistor - Variable, wirewound, 10K ohms, 10%, 2 Watt, (Clarostat 43M or equal)	2-17
2-45	R719		Same as R466	
2-46	R733		Same as R137	2-25
2-46	R751		Same as R137	
2-46	R756		Same as R333	2-19
2-47	R806		Same as R429	2-14
2-47	R808		Same as R429	2-14
2-48	R863		Same as R233	2-27
2-49	S201	19912-470	Switch - Rotary, time base A trigger	
2-49	S202	19910-136	Switch - Push button, reset	
2-49	S301	19912-474	Switch - Rotary, time base A timing	
2-49	S401	19912-472	Switch - Rotary, time base B trigger	

PAGE NO.	INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
2-49	S430	19912-473	Switch - Rotary, time base B timing	
2-49	S701	19911-57	Switch - Toggle, chopped blanking	
2-49	S751	19912-471	Switch - Rotary, calibrator	
2-49	S852	19912-476	Switch - Rotary, rear horizontal display	
2-49	S853	19912-475	Switch - Rotary, front horizontal display	
2-49	TK601	19913-3	Switch - Thermal cut-out type SEII, 1-1/4 in. x 3/8 in. (Thermodisc type 6240, or equal)	
2-49	V103	20877-15	Tube - 6DJ8 ┐ SELECTED AND PAIRED	2-4
2-49	V104		Same as V103 ┘	2-4
2-49	V107	20875-180	Tube - 6DJ8	2-4
2-50	V251		Same as V107	2-9
2-50	V253		Same as V107	2-9
2-50	V255		Same as V107	2-9
2-50	V262		Same as V107	2-9
2-50	V263		Same as V107	2-9
2-50	V450		Same as V107	2-11
2-50	V451		Same as V107	2-11
2-50	V454		Same as V107	2-11
2-50	V553		Same as V107	2-11
2-50	V554		Same as V107	2-11
2-51	V801		Same as V107	2-11
2-51	V852	20877-22	Tube - 6DJ8 ┐ SELECTED AND PAIRED	
2-51	V854		Same as V852 ┘	2-9
2-52	XF602	8825-14	Holder - Fuse, (Bussman Part No. HKP)	

SECTION II

PARTS BREAKDOWN

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C101	3110-65	Capacitor - Fixed, ceramic, 4700 uuf, 500 V., +100 -20%, disc type (Erie No. ED- .0047 or equal)	2-3
C102		Same as C101	2-3
C103	3110-107	Capacitor - Fixed, ceramic, .001 uf, GMV, disc type (Erie No. ED-.001 or equal)	2-3
C104	3085-102	Capacitor - Fixed, electrolytic, 2 x 20 uf, -10 +100%, 450V., metal cased (Sprague type SP-CE32F200R, incl 3275-123 clamp or equal)	2-4
C105	3085-98	Capacitor - Fixed, electrolytic, 3 sect 10, 30, 40 uf, -10 +50%, 475 V., metal cased, 1-3/8 in. x 3 in. (Sprague Part No. TVL-3842.6, incl metal mtg washer or equal)	2-4
C106	3105-359	Capacitor - Fixed, paper, .1 uf, 10%, 400V., tubular, (Sprague Difilm Black Beauty No. 160P10494, 1/2 in. x 1-1/2 in. or equal)	2-3
C109	3085-103	Capacitor - Fixed, electrolytic, 4 x 75 uf, 150 V., 1-9/16 in. ±1/32 in. x 2-13/16 in. ±1/16 in. over cardboard sleeve (Sprague Part No. 5Z934-913, incl phenolic washer or equal)	2-4

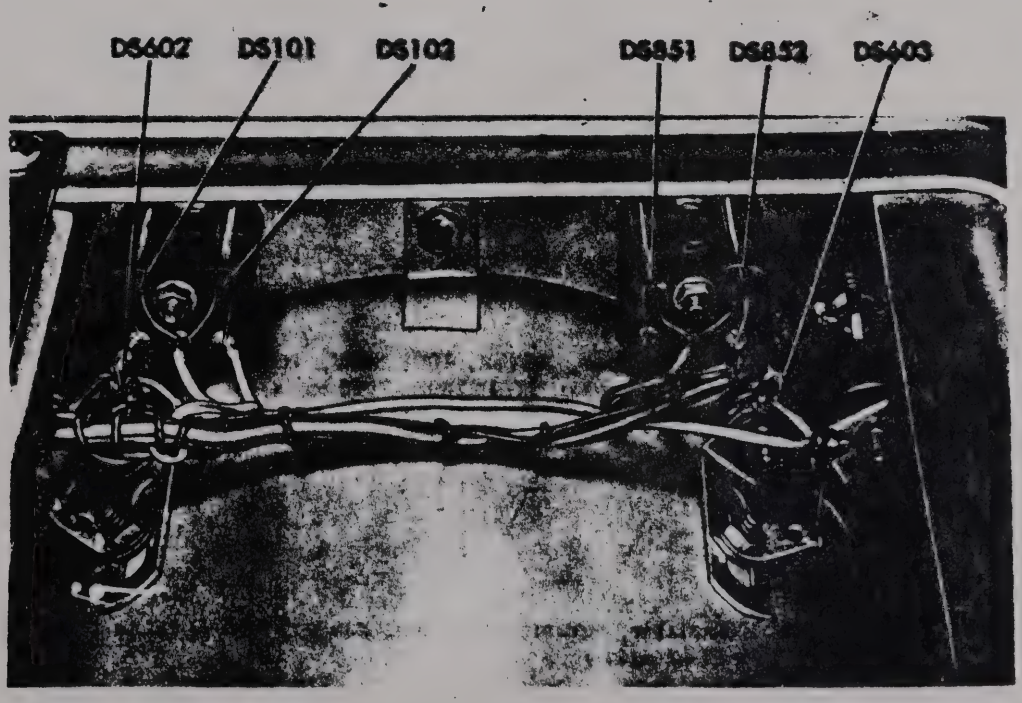


Figure 2-1. Top of CRT Showing Location of Components.

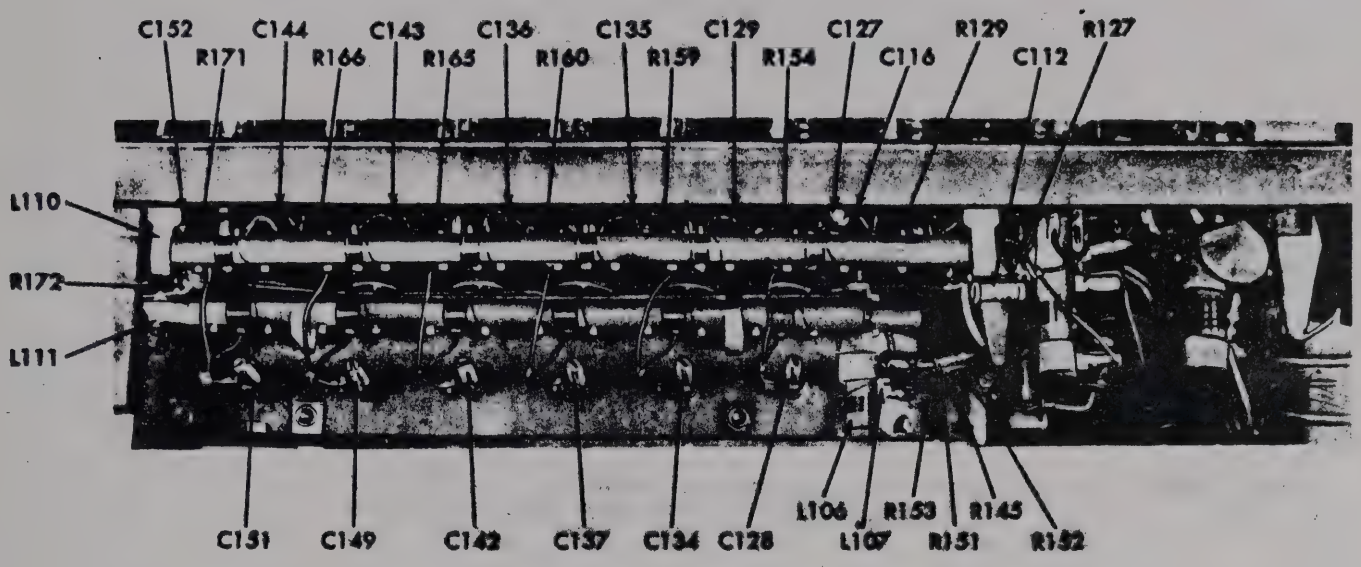


Figure 2-2. Part of Vertical Amplifier Showing Location of Components.

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C111	3110-112	Capacitor - Fixed, ceramic, .001 uf, 500 V., 10%, tubular, 3/8 in. x 1/8 in. (Erie type X5U0102K, Style 301, non-insulated or equal)	2-5
C112		Same as C111	2-2
C113		Same as C101	2-3
C116		Same as C103	2-2
C117		Same as C101	2-3
C118	3110-100	Capacitor - Fixed, ceramic, 150 uuf, ±20%, 500V. (Erie No. GP2A150 ±30 uuf or equal)	2-4
C119		Same as C103	2-5
C120		Same as C103	2-3
C121	3105-354	Capacitor - Fixed, paper, .022 uf, 10%, 600V., tubular (Sprague Difilm Black Beauty No. 160P22396, 7/16 in. x 1-1/4 in. or equal)	2-18 & 2-26
C122		Same as C101	2-3
C126		Same as C101	2-3
C127		Same as C118	2-2
C128	3115-25	Capacitor - Variable, ceramic, .7-3 uuf, tubular, 500 V. (Erie type 535-17 or equal)	2-2
C129		Same as C103	2-2

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C130		Same as C118	2-4
C131		Same as C103	2-5
C132		Same as C103	2-5
C133		Same as C118	2-4
C134		Same as C128	2-2
C135		Same as C103	2-2
C136		Same as C103	2-2
C137		Same as C128	2-2
C138		Same as C118	2-4
C139		Same as C103	2-5
C140		Same as C103	2-5

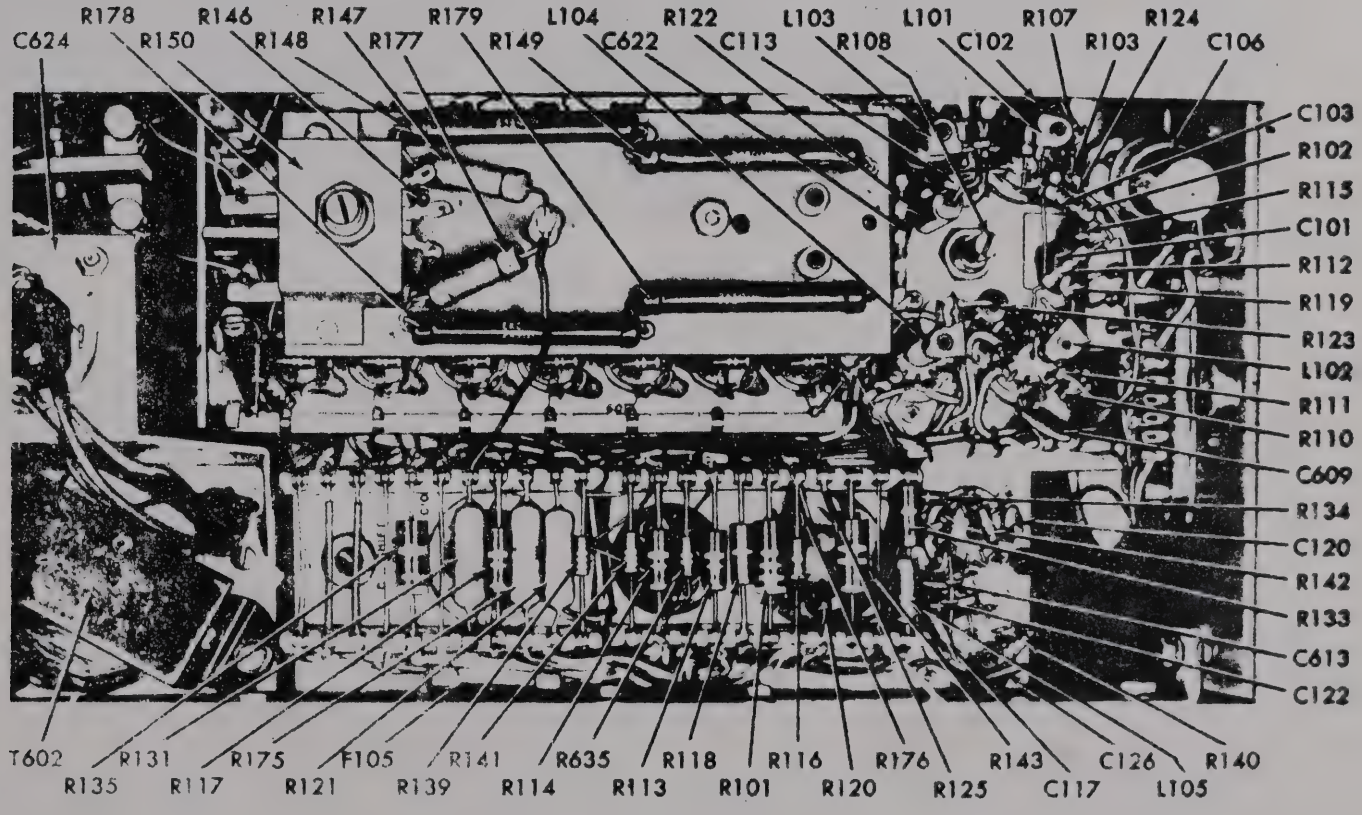


Figure 2-3. Vertical Amplifier Showing Location of Components.

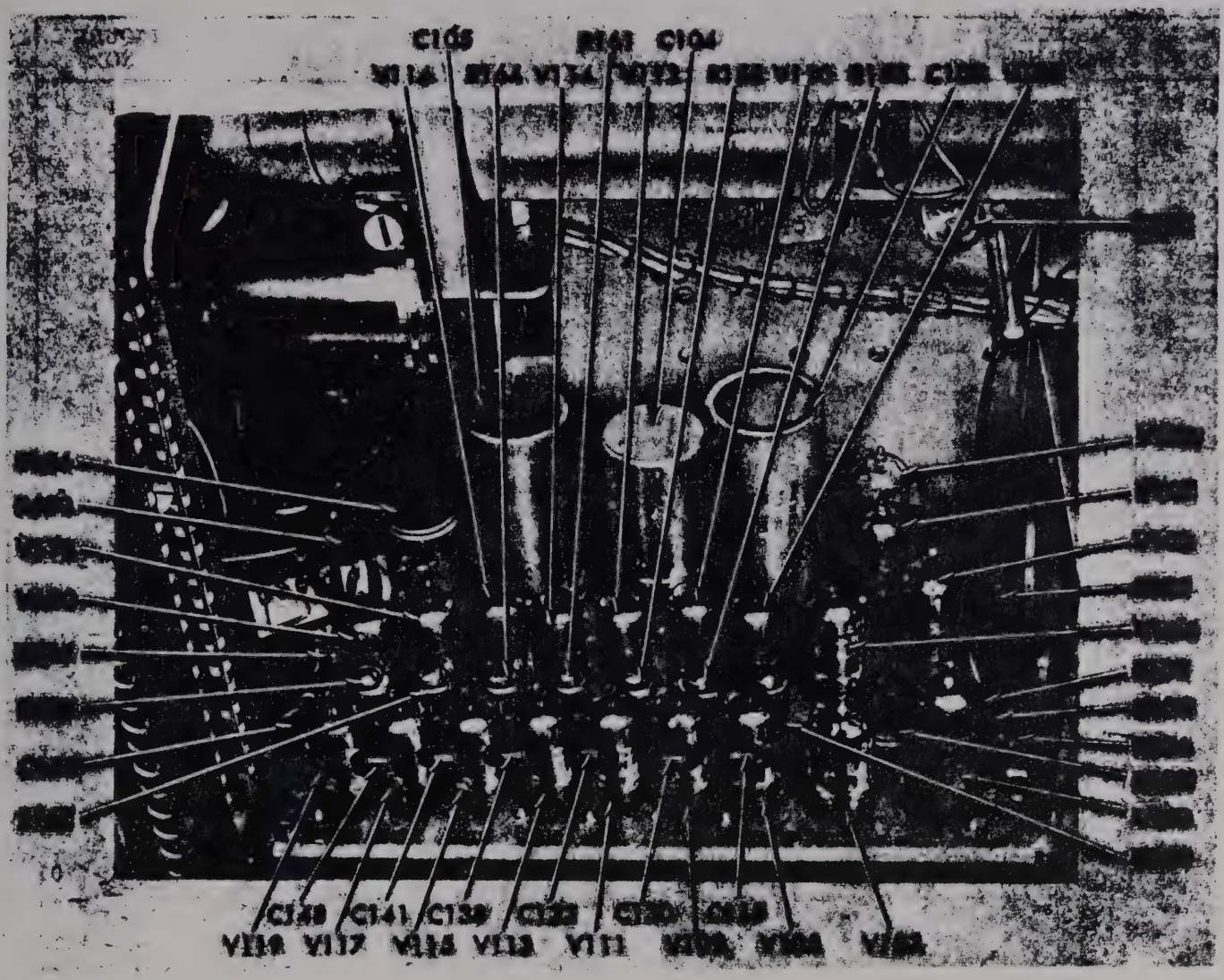


Figure 2-4. Top of Vertical Amplifier Showing Location of Components.

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C141		Same as C118	2-4
C142		Same as C128	2-2
C143		Same as C103	2-2
C144		Same as C103	2-2
C148		Same as C118	2-4
C149		Same as C128	2-2
C150		Same as C118	2-5
C151		Same as C128	2-2
C152		Same as C103	2-2
C153		Same as C103	2-5

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C154		Same as C103	2-5
C155		Same as C101	2-4
C156		Same as C101	2-27
C201	3110-87	Capacitor - Fixed, ceramic, 4.7 uuf, ±1 uuf, 500 V. (Erie No. N330A4.7 ±1.0 uuf or equal)	2-6
C202	3105-357	Capacitor - Fixed, paper, .0022 uf, 10%, 600V., tubular (Sprague Difilm Black Beauty No. 160P2296 or equal)	2-6
C203	3110-99	Capacitor - Fixed, ceramic, 100 uuf, ±20%, 350 V. (Erie No. GP1A100 ±20 uuf or equal)	2-6
C204		Same as C103	2-6
C205	3110-97	Capacitor - Fixed, ceramic, 47 uuf, ±10%, 500 V. (Erie 301, GP1A47 ±5.7 uuf or equal)	2-7
C206		Same as C103	2-6
C207	3105-307	Capacitor - Fixed, paper, .047 uf, 10%, 400 V., tubular (Sprague Difilm Black Beauty No. 160P47394, 7/16 in. x 1-1/4 in. or equal)	2-7
C208		Same as C101	2-7
C210	3110-91	Capacitor - Fixed, ceramic, 22 uuf, ±10%, 500 V. (Erie GP1A22 ±2.2 uuf or equal)	2-7
C250	3110-95	Capacitor - Fixed, ceramic, 27 uuf ±10%, 500 V. (Erie 301, GP1A27 ±5.4 uuf or equal)	2-7

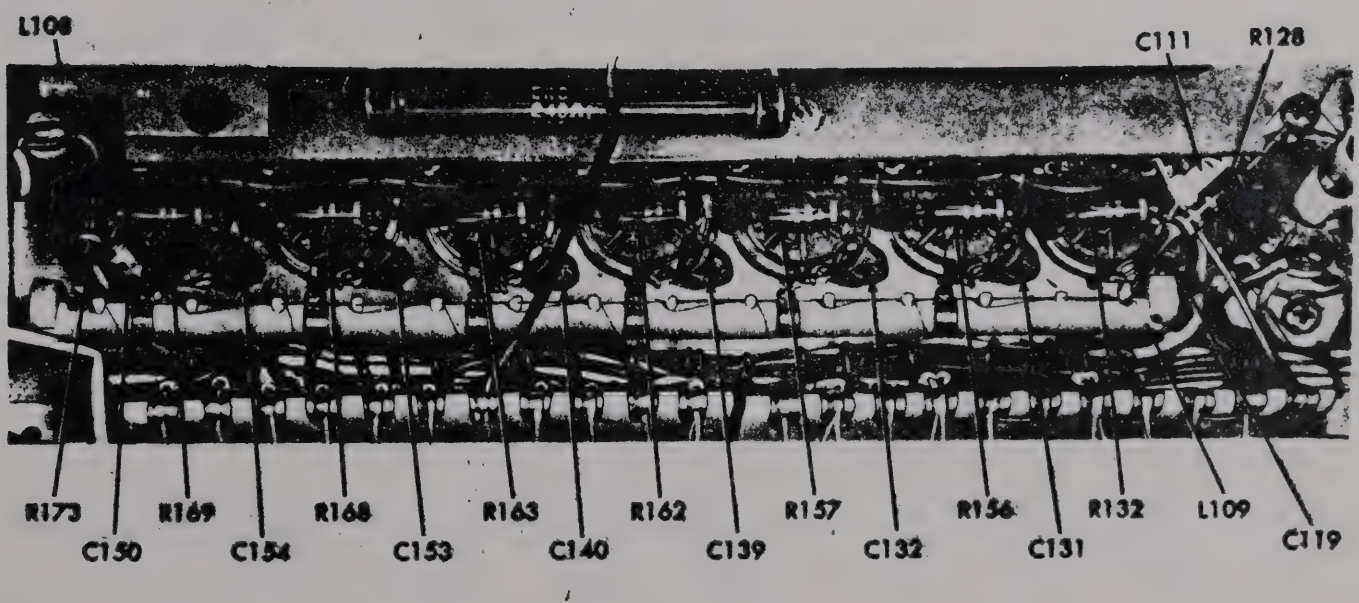


Figure 2-5. Part of Vertical Amplifier Showing Location of Components.

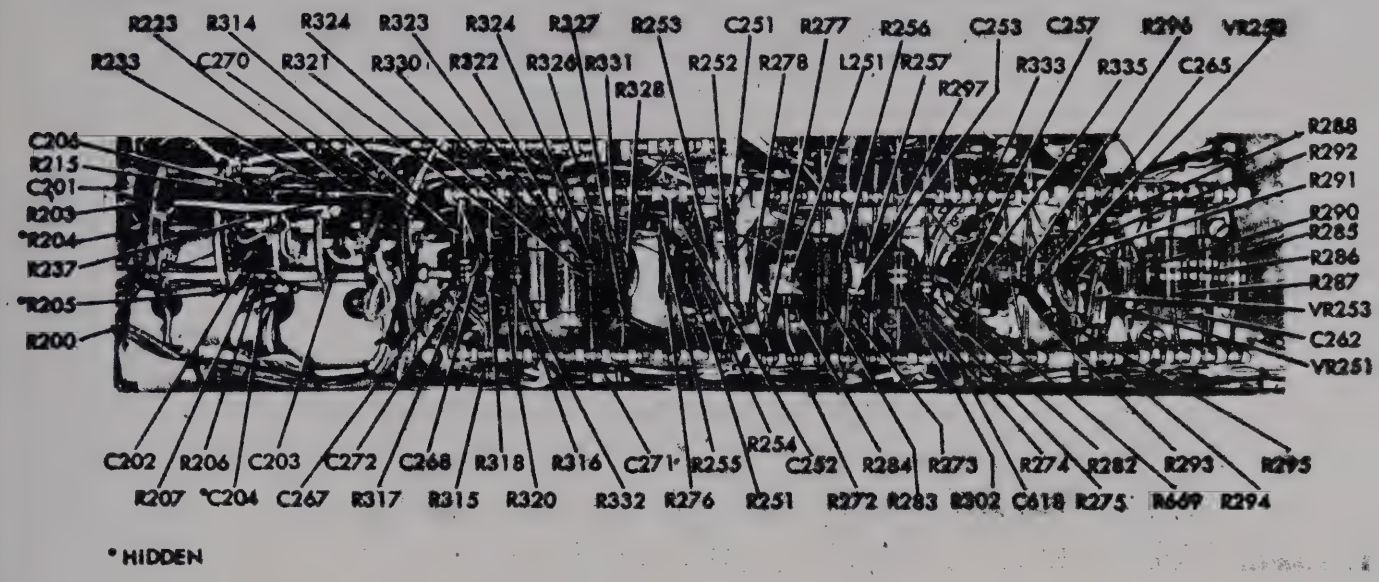


Figure 2-6. Sweep Generator Chassis Showing Location of Components.

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C251	3110-88	Capacitor - Fixed, ceramic, 8 uuf ±0.5 uuf, 500 V. (Erie NPO 60A8 ±0.5 uuf or equal)	2-6
C252		Same as C101	2-6
C253		Same as C201	2-6
C254		Same as C101	2-7
C255	3110-128	Capacitor - Fixed, ceramic, 15 uuf, 10%, 500 V. (Erie No. GP1A15 ±1.5 uuf or equal)	2-7
C256		Same as C101	2-7
C257		Same as C101	2-6
C258		Same as C203	2-7
C260		Same as C205	2-7
C262	3095-77	Capacitor - Fixed, mica, 470 uuf, 20%, 1500V. (Cornell Dubilier type 5P15T47 or equal)	2-6 & 2-27
C263		Same as C103	2-7
C264		Same as C255	2-7
C265		Same as C103	2-6
C266		Same as C103	2-12
C267		Same as C210	2-6
C268		Same as C103	2-6

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C270		Same as C101	2-6
C271		Same as C201	2-6
C272	3110-64	Capacitor - Fixed, ceramic, .01 uf, +100 -20%, 500 V., disc type (Erie No. ED-.01 or equal)	2-6
C273	3110-183	Capacitor - Fixed, ceramic, .02 uf, 600 V., GMV, disc type (Erie type ED-.02 or equal)	2-12
C274		Same as C101	2-12
C275	3110-90	Capacitor - Fixed, ceramic, 12 uuf, 10%, 500 V., (Erie No. GP1A12 ±1.2 uuf or equal)	2-7
C351	3105-360	Capacitor - Fixed, paper, .22 uf, 10%, 400 V., tubular, (Sprague Difilm Black Beauty No. 160P10592, 5/8 in. x 1-7/8 in. or equal)	2-8
C352		Same as C121	2-8
C353		Same as C202	2-8
C354	3095-210	Capacitor - Fixed, mica, 150 uuf, 10%, 500 V., (Micamold No. MCM20C151K or equal)	2-8
C355	3105-349	Capacitor - Assy	2-17
C356		Same as C355	2-17
C357		Same as C355	2-17
C358	3090-29	Capacitor - Fixed, mylar, .001 uf, +0 -1/4%, 400 V., tubular	2-8

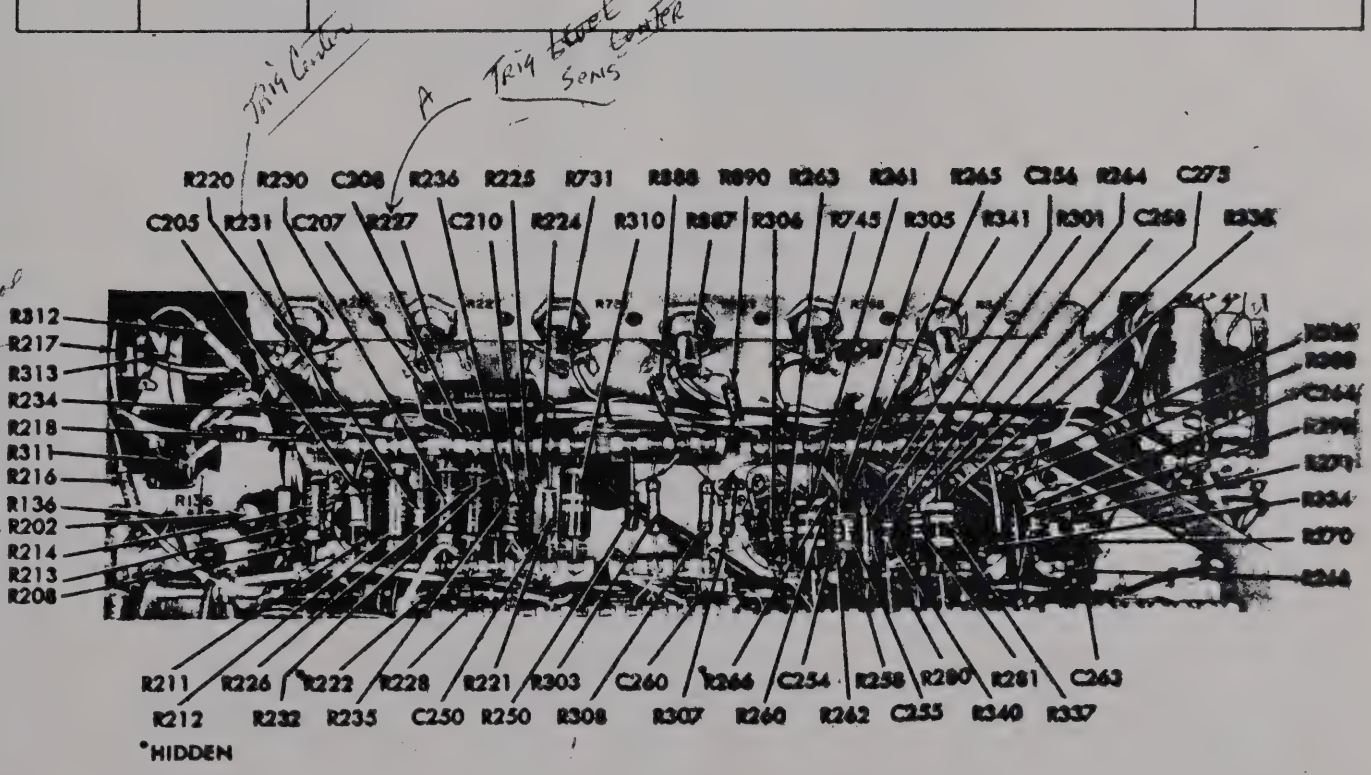


Figure 2-7. Sweep Generator Chassis Showing Location of Components.

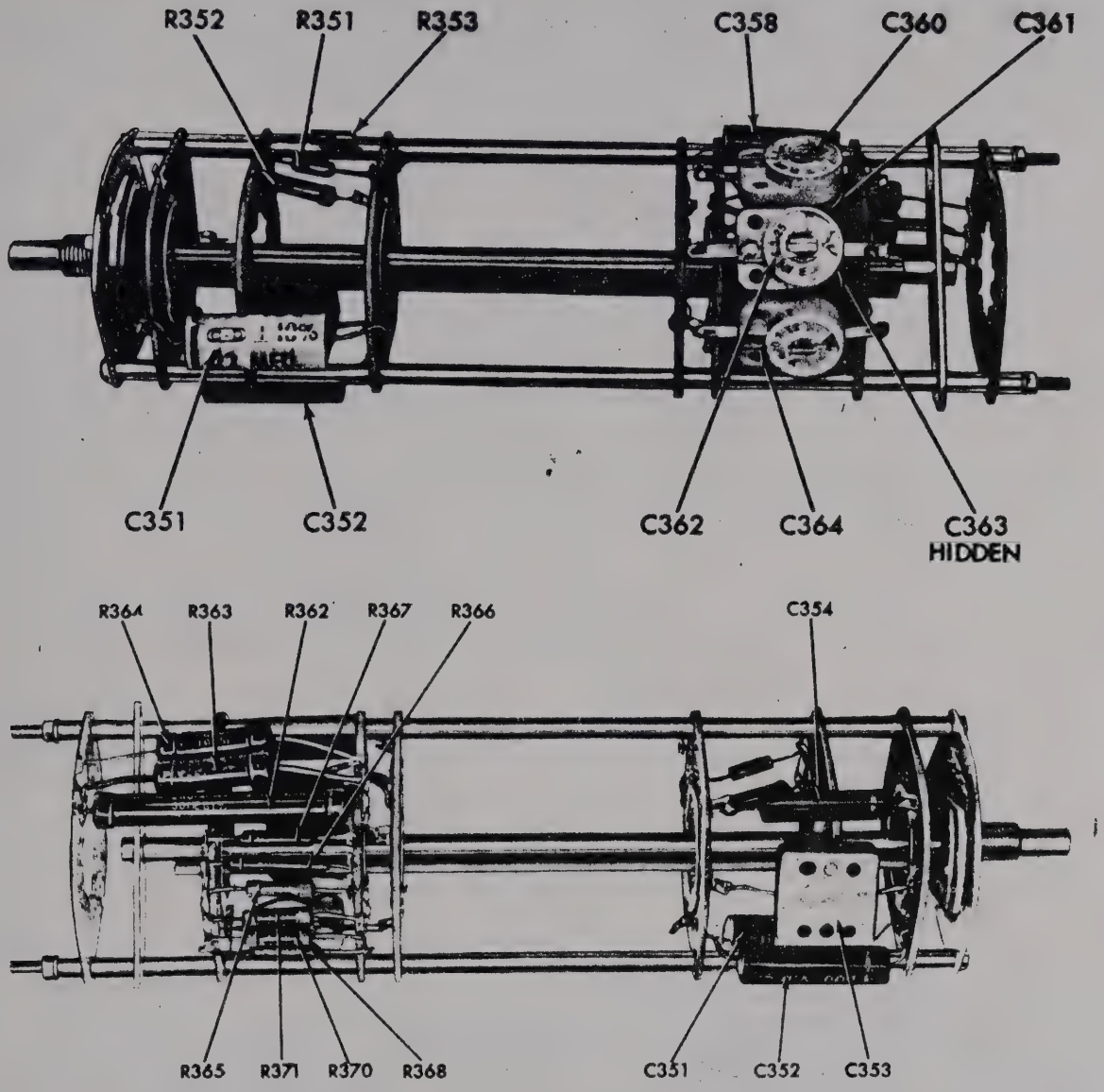


Figure 2-8. Time Base A Timing Switch Showing Location of Components.

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C360	3115-20	Capacitor - Variable, ceramic, 4.5-25 uuf, 20%, 500 V., (Erie type 503-27 (or TS2A) NPO 4.5-25 uuf or equal)	2-8
C361	3095-104	Capacitor - Fixed, mica, 82 uuf, 5%, 500 V., CM20 Size (Micamold No. MCM20C820J)	2-8
C362		Same as C360	2-8
C363		Same as C361	2-8
C364	3115-23	Capacitor - Fixed, ceramic, 3-12 uuf, 20%, 500 V. (Erie type No. 503-27 (or TS2A) NPO 3-12 uuf or equal)	2-8
C401		Same as C251	2-12

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C402	3105-356	Capacitor - Fixed, paper, .001 uf, 20%, 600 V., tubular (Sprague Difilm Black Beauty No. 160P10206, 5/16 in. x 1 in. or equal)	2-12
C403		Same as C103	2-12
C404		Same as C103	2-11
C405		Same as C103	2-12
C406	3110-132	Capacitor - Fixed, ceramic, .0068 uf, ±10%, 500 V. (Erie GP5X5S, disc Style 811 or equal)	2-15
C407		Same as C210	2-15
C408		Same as C101	2-15
C410		Same as C101	2-14
C432		Same as C106	2-10
C433		Same as C106	2-10
C434		Same as C121	2-10
C435		Same as C202	2-10

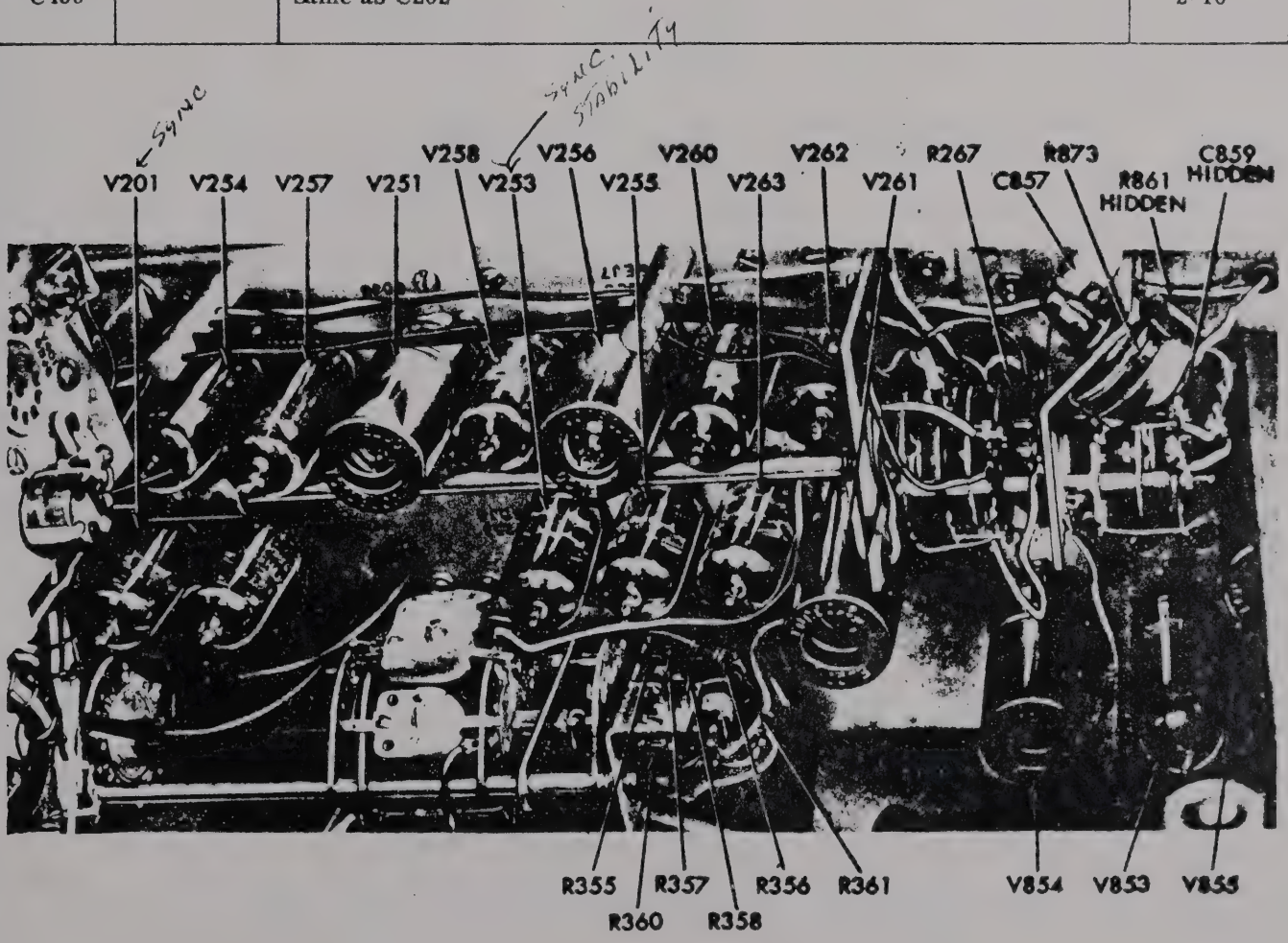


Figure 2-9. Part of Time Base A Generator Showing Location of Components.

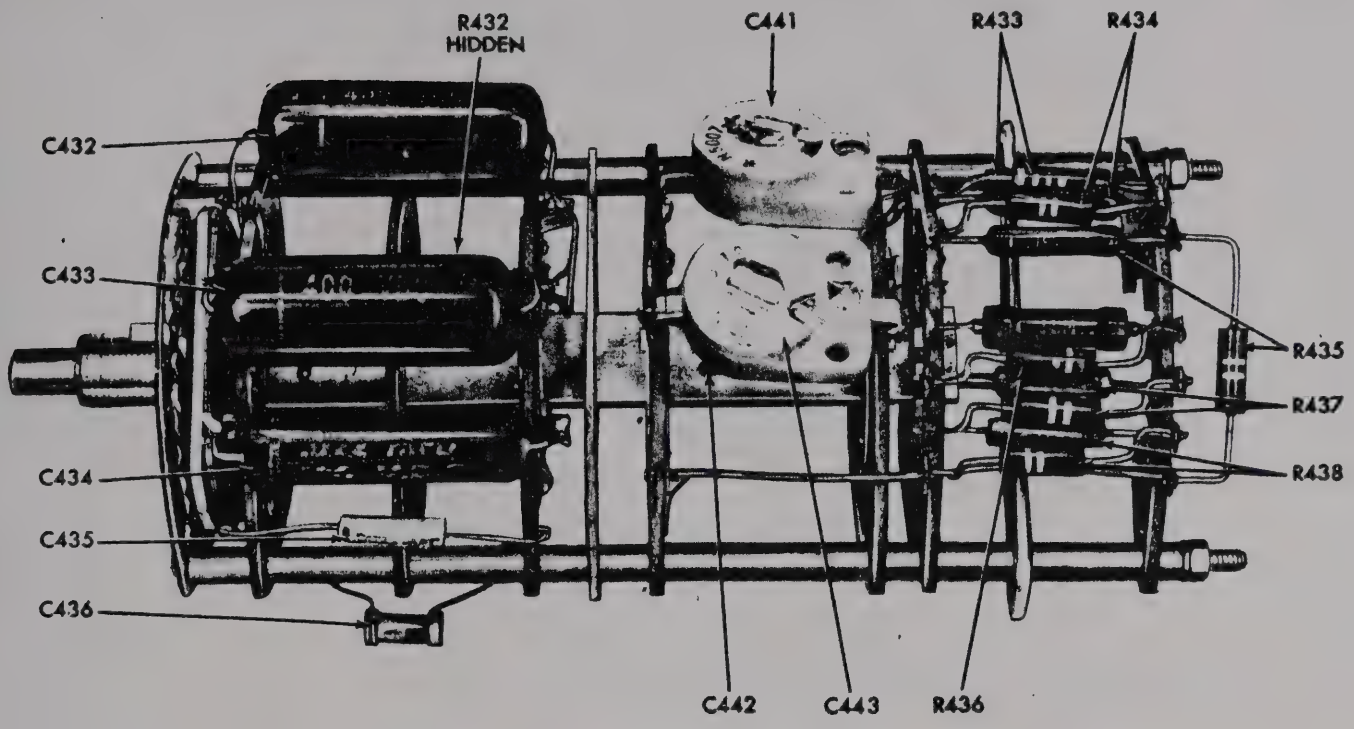


Figure 2-10. Time Base B Timing Switch Showing Location of Components.

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C436		Same as C354	2-10
C437	3105-313	Capacitor - Assembly (power supply chassis)	2-13
C438		Same as C437	2-13
C439		Same as C437	2-13
C440		Same as C437	2-13
C441	3115-21	Capacitor - Variable, ceramic, 7-45 uuf, 20%, NPO 500 V. (Erie Type 503-27, or TS2A, 7-45 uuf or equal)	2-10 & 2-17
C442	3095-49	Capacitor - Fixed, mica, 39 uuf, 5%, 500 V., CM20 Size (Micamold No. MCM20C390J)	2-10 & 2-17
C443		Same as C364	2-10 & 2-17
C451		Same as C250	2-15
C452	3110-184	Capacitor - Fixed, ceramic, 10 uuf, 10%, 500 V. (Erie No. GP1A10 ±1.0 uuf or equal)	2-15
C453	3110-93	Capacitor - Fixed, ceramic, .02 uf, 150 V., GMV, disc type, (Erie or equal)	2-15

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C454		Same as C255	2-15
C455		Same as C101	2-14
C456		Same as C210	2-15
C457		Same as C103	2-15
C458		Same as C203	2-15
C459	3110-186	Capacitor - Fixed, ceramic, 33 uuf, 10%, 500 V. (Erie No. GP1A33 ±3.3 uuf or equal)	2-15
C551		Same as C101	2-14
C552		Same as C272	2-14
C553		Same as C210	2-14
C554		Same as C205	2-14
C555		Same as C101	2-14
C601	3085-88	Capacitor - Fixed, electrolytic, 2 x 40 uf, -10 +50%, 450 V., metal cased, 1-3/8 in. x 3 in. with insulating sleeve (Sprague Part No. TVL-2764, plus HKT-7, incl phenolic mtg washer 23480-22 or equal)	2-13 & 2-17 & 2-18

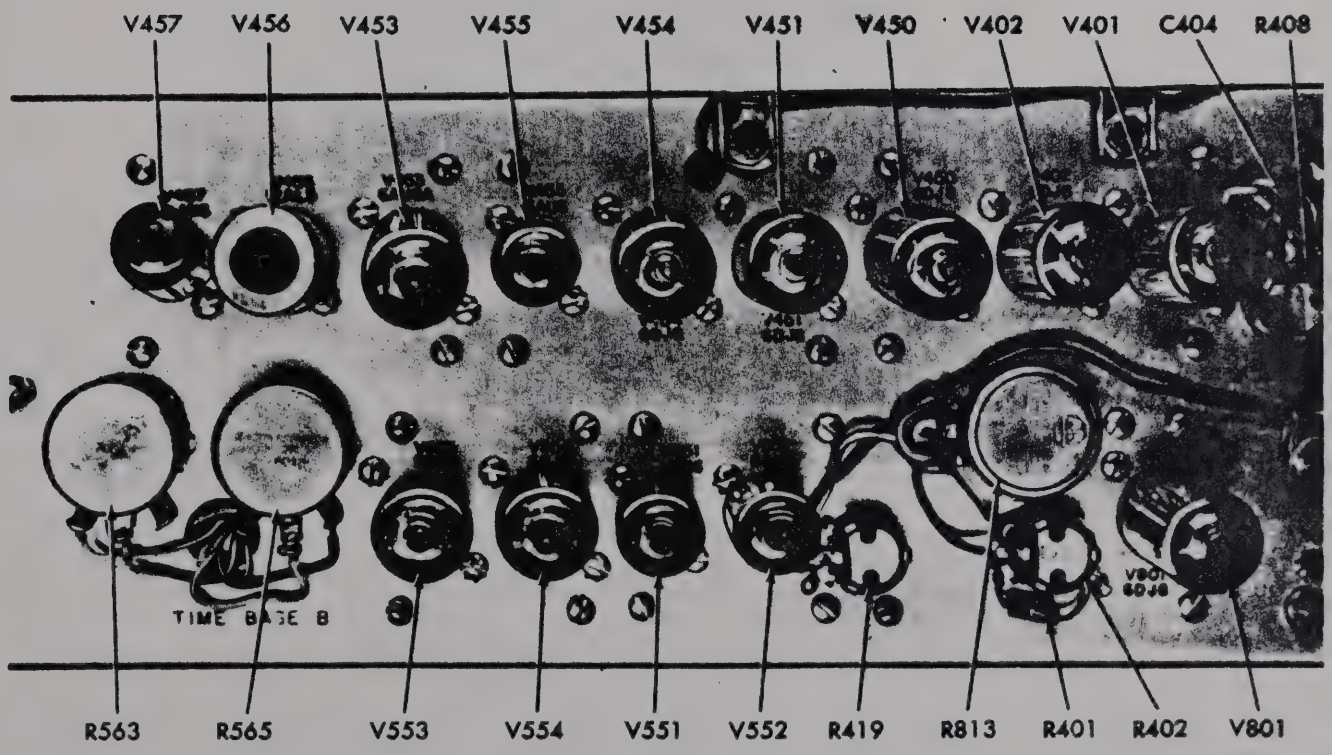


Figure 2-11. Time Base B Chassis Showing Location of Components.

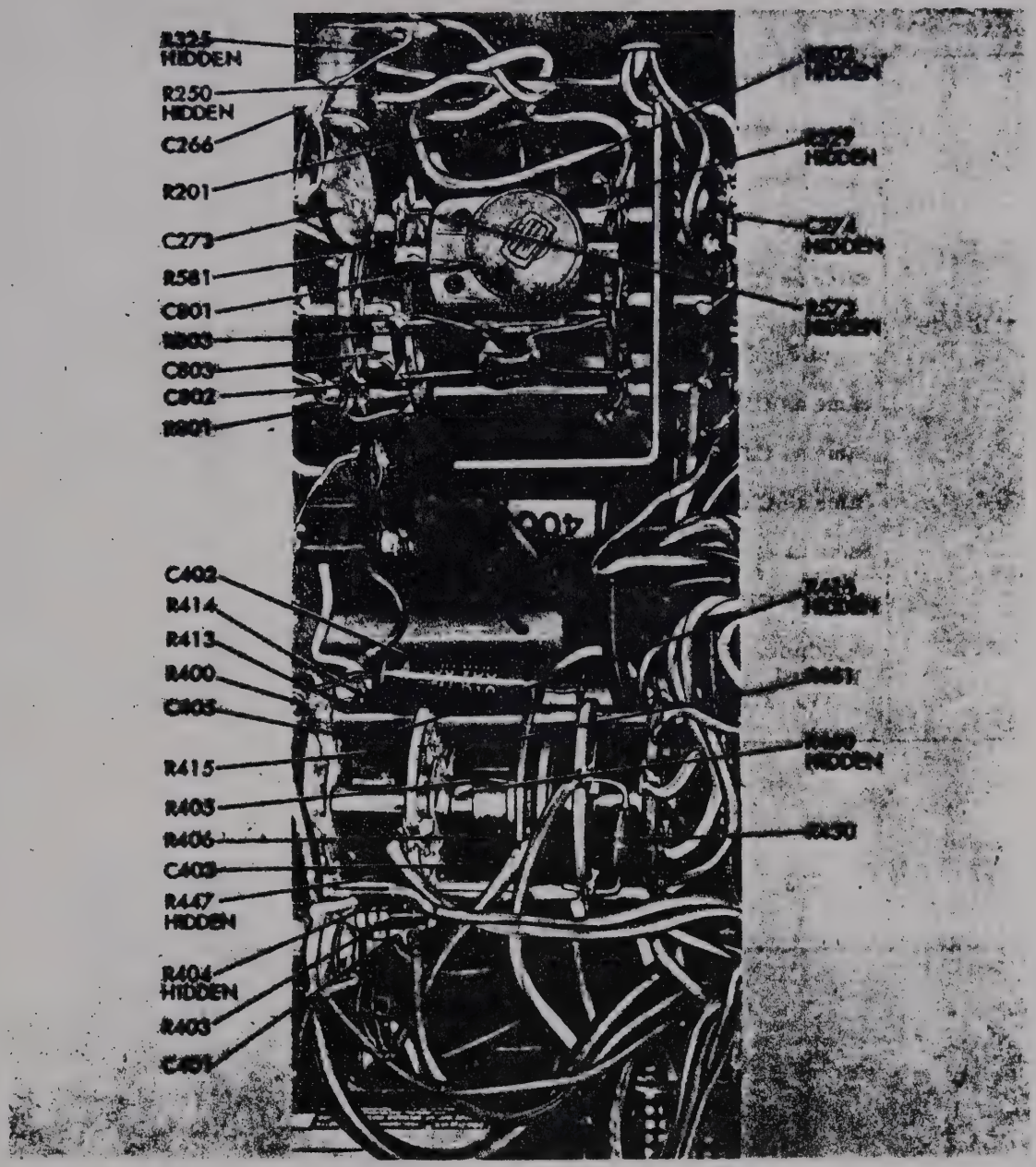


Figure 2-12. Part of Time Base A and B Timing Switches Showing Location of Components.

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C602	3105-355	Capacitor - Fixed, paper, .01 uf, 20%, 400 V., tubular (Sprague Difilm Black Beauty No. 160P10304, 3/8 in. x 1-1/4 in. or equal)	2-19
C603	3085-185	Capacitor - Fixed, electrolytic, 100 uf, -10 +100%, 450 V., metal cased, with insulating sleeve (Sprague Part No. TVL-1750 plus HKT-7, incl phenolic washer 23480-22 or equal)	2-17 & 2-18
C604	3105-358	Capacitor - Fixed, paper, .01 uf, 20%, 600 V., tubular (Sprague Difilm Black Beauty No. 160P10306, 3/8 in. x 1-1/4 in. or equal)	2-19

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C605	3085-95	Capacitor - Fixed, electrolytic, 3 x 10 uf, -10 +50%, 450 V., metal cased (1 in. x 3 in.) (Sprague Part No. TVL-3776, incl metal mtg washer or equal)	2-20 & 2-27
C606	3085-91	Capacitor - Fixed, electrolytic, 125 uf, -10 +50%, 450 V., metal cased, 1-3/8 in. x 4 in. (Sprague Part No. TVL-1760, 85° C, incl metal mtg washer or equal)	2-13 & 2-17 & 2-18
C607		Same as C602	2-19
C608		Same as C602	2-19
C609		Same as C101	2-3
C610	3085-92	Capacitor - Fixed, electrolytic, 150 uf, -10 +100%, 250 V., metal cased, 1-3/8 in. x 2-1/2 in. (Sprague Part No. TVL-1540, 85° C, incl metal mtg washer or equal)	2-17 & 2-18
C611		Same as C610	2-17 & 2-18
C612		Same as C602	2-19
C613		Same as C101	2-3

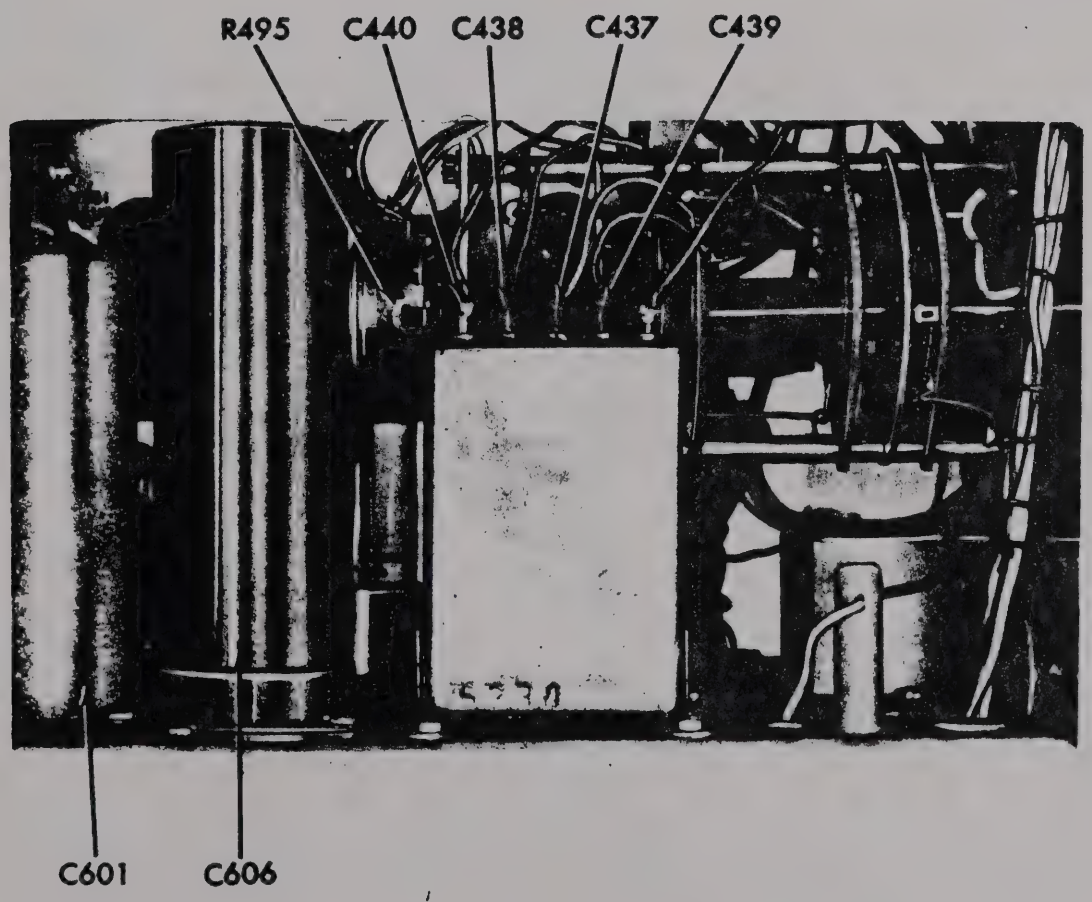


Figure 2-13. Part of Main Chassis Showing Location of Components.

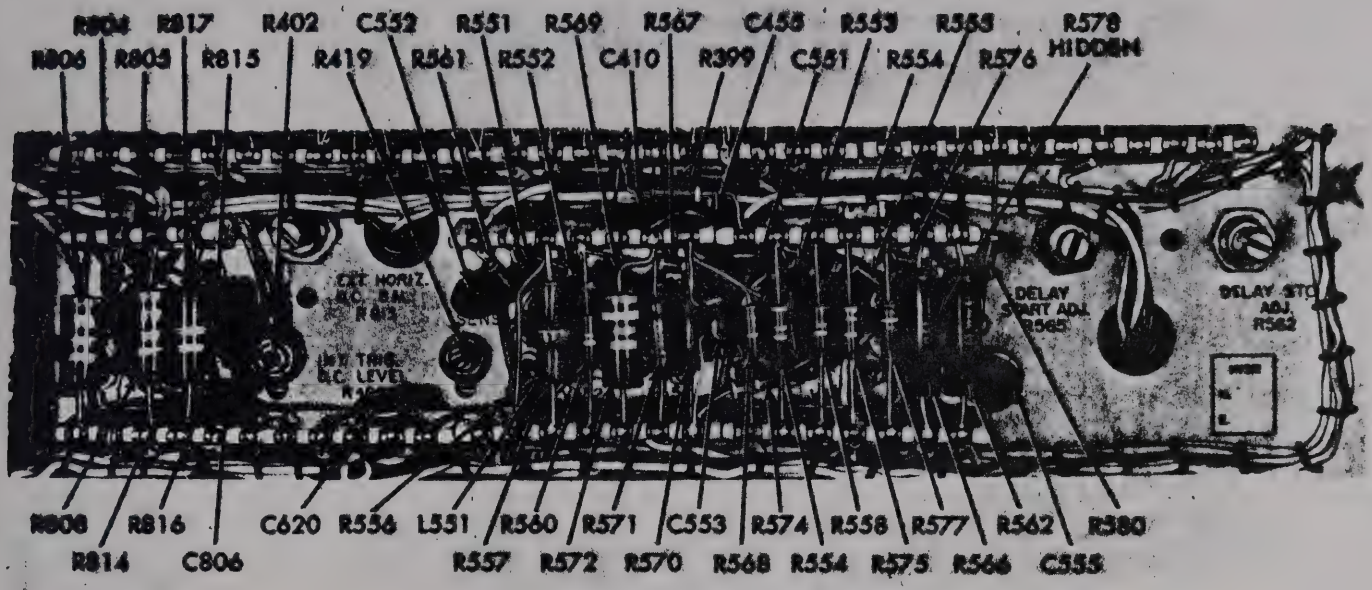


Figure 2-14. Components Located on Hinged Door.

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C614	3085-89	Capacitor - Fixed, electrolytic, 125 uf, -10 +100%, 350 V., metal cased, with insulating sleeve, 1-3/8 in. x 3-1/2 in. (Sprague Part No. TVL-1638 plus HKT-8, incl phenolic mtg washer 23480-22 or equal)	2-21
C615		Same as C602	2-19
C616		Same as C602	2-19
C617		Same as C602	2-18
C618		Same as C272	2-6
C619	3085-97	Capacitor - Fixed, electrolytic, 2 x 40 uf, -10 +100%, 250 V., metal cased, 1 in. x 2 in., with insulating sleeve (Sprague Part No. TVL-2520 plus HKT-1 or equal)	2-21
C620		Same as C272	2-14
C621		Same as C453	2-22
C622		Same as C101	2-3
C624	3085-186	Capacitor - Fixed, electrolytic, 1000 uf, 50 V., metal cased, 1-3/8 in. x 2-1/2 in. with insulating sleeve (Sprague Part No. TVL-1338, incl metal mtg washer or equal)	2-3
C701		Same as C207	2-27
C702		Same as C402	2-27
C703		Same as C602	2-27

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C704	3085-96	Capacitor - Fixed, electrolytic, 2 x 20 uf, -10 +50%, 450 V., metal cased, 1 in. x 3 in. (Sprague Part No. TVL-2755, incl metal mtg washer or equal)	2-20 & 2-27
C705		Same as C402	2-27
C706		Same as C272	2-27
C707	3105-250	Capacitor - Fixed, paper, .0068 uf, ±20%, 3000 V., tubular (Sprague Pre-Molded No. 184P682030, 1/2 in. x 1-1/2 in. or equal)	2-23
C708	3105-247	Capacitor - Fixed, paper, 470 uuf, ±20%, 10 KV. (Sprague Pre-Molded No. 184P4710100, 5/8 in. x 1-7/8 in. or equal)	2-23
C709		Same as C708	2-23
C710	3105-251	Capacitor - Fixed, paper, .0068 uf, ±20%, 5000 V. (Sprague Pre-Molded No. 184P682050, 5/8 in. x 1-7/8 in. or equal)	2-23
C711		Same as C707	2-23
C715		Same as C708	2-24
C716	3105-241	Capacitor - Fixed, paper, .015 uf, ±20%, 3000 V. (Sprague Pre-Molded No. 184P153030, 5/8 in. x 1-7/8 in. or equal)	2-25
C717		Same as C716	2-25
C720		Same as C710	2-23
C721		Same as C710	2-25
C722		Same as C716	2-25
C751	3095-137	Capacitor - Fixed, mica, 330 uuf, ±10%, 500 V. (Micamold No. MCM20C331K or equal)	2-18
C752		Same as C751	2-18

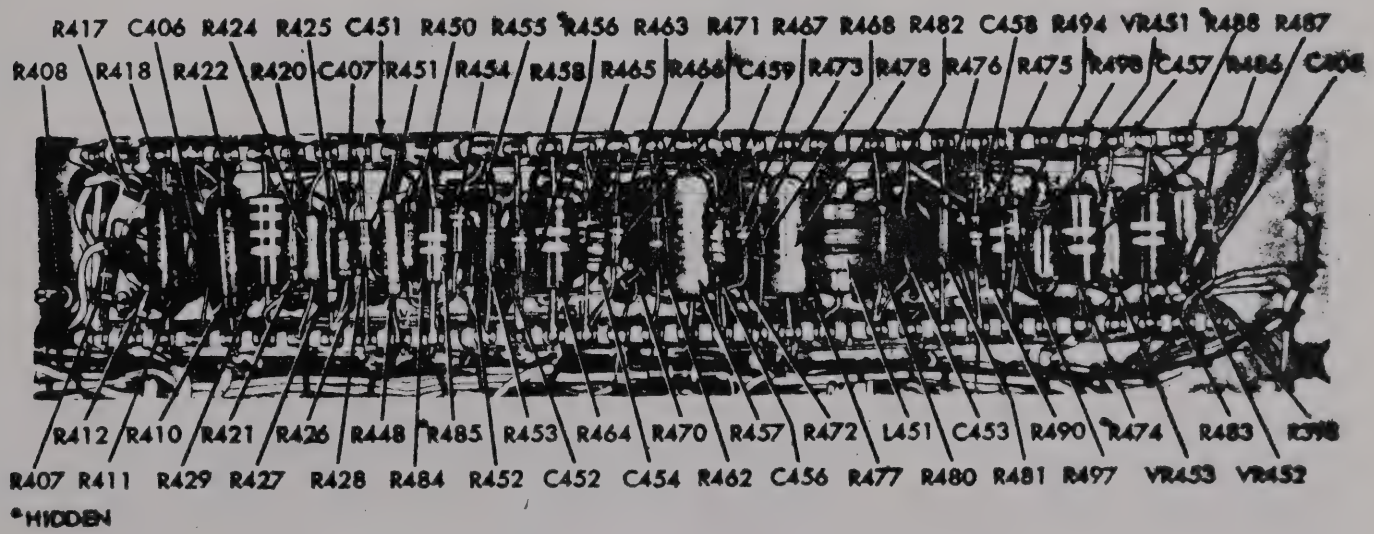


Figure 2-15. Part of Time B Sweep Generator Showing Location of Components.

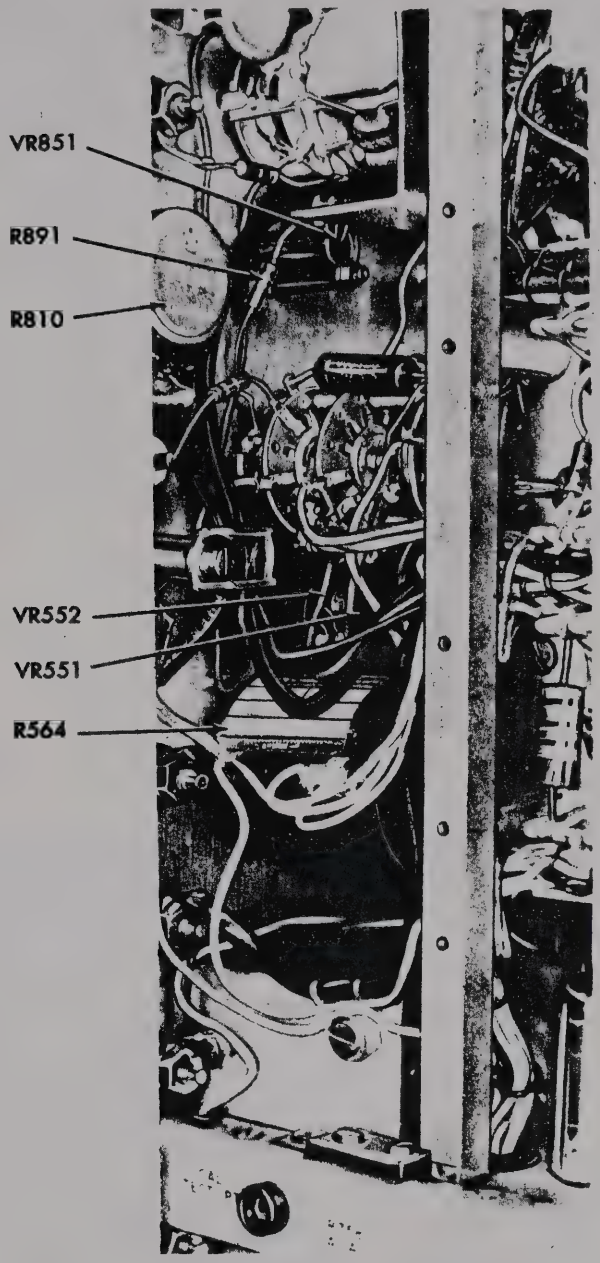


Figure 2-16. Part of Front Panel Showing Location of Components.

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C753		Same as C250	2-18
C754		Same as C103	2-26
C801		Same as C441	2-12
C802		Same as C751	2-12
C803		Same as C275	2-12

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C806		Same as C101	2-14
C851		Same as C101	2-27
C852		Same as C441	2-27
C853		Same as C101	2-27
C854		Same as C201	2-27
C855	3115-14	Capacitor, - Variable, ceramic, 3-12 uuf, NPO, 350 V. (Erie type 557-06NPO3-12 uuf or equal)	2-27
C856		Same as C207	2-27

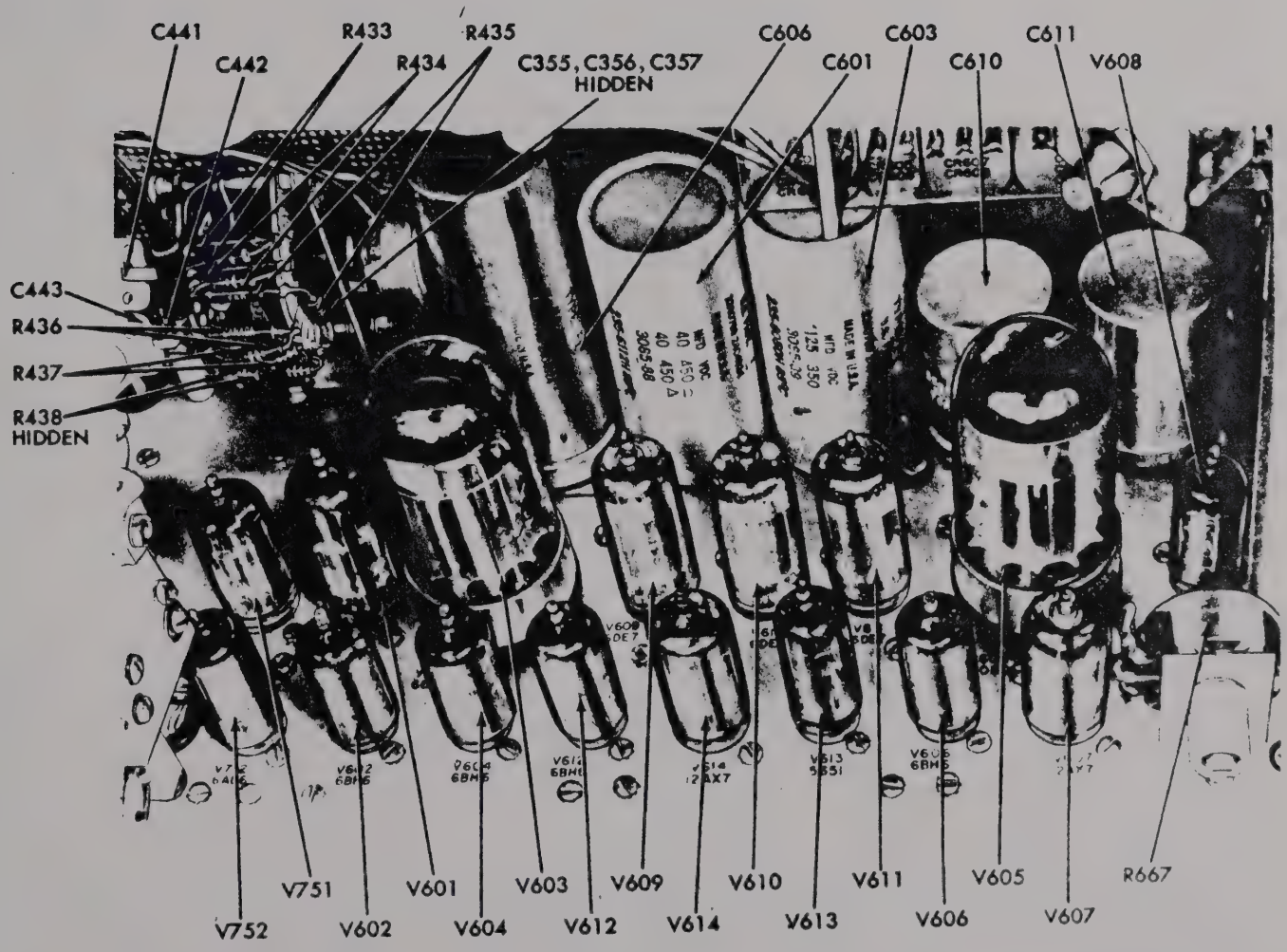


Figure 2-17. Low Voltage Power Supply Chassis Showing Location of Components.

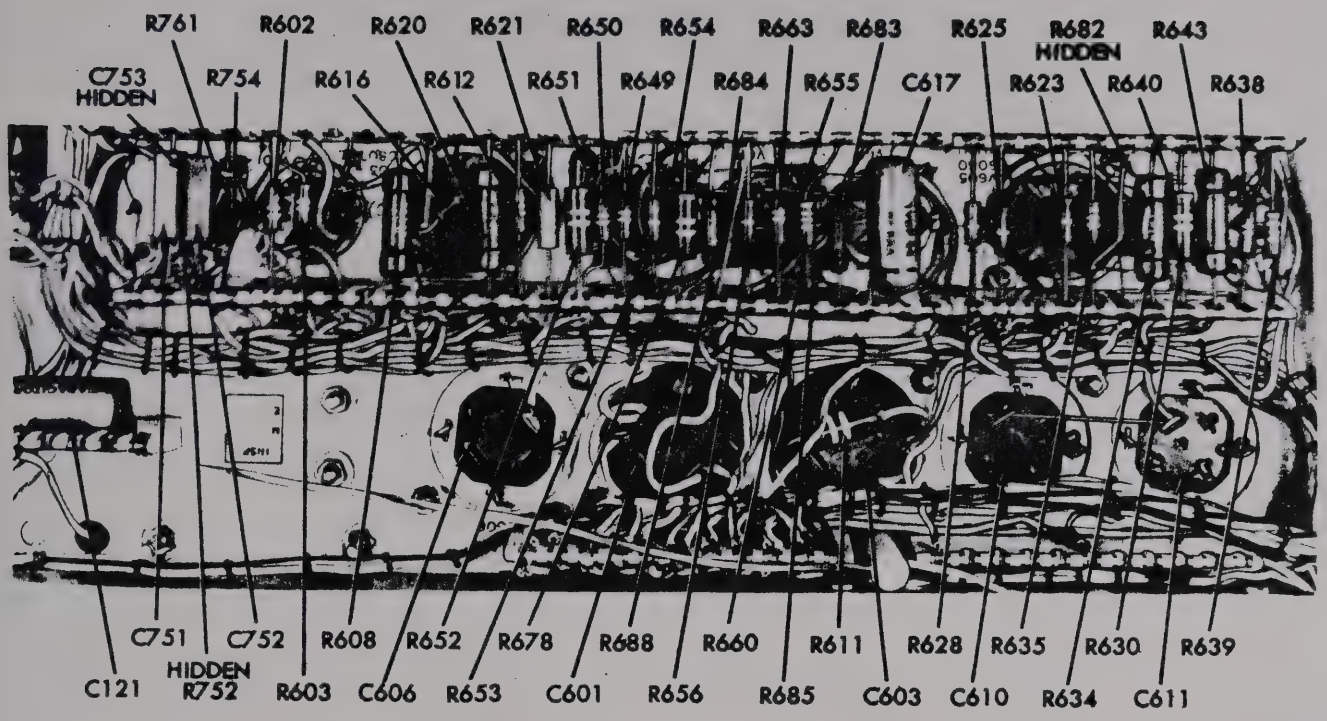


Figure 2-18. Part of Low Voltage Power Supply Showing Location of Components.

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C857	3115-16	Capacitor - Variable, ceramic, 1.5-7 uuf (Erie type 503-27, or TS2A, NPO 1.5-7 uuf)	2-9
C858		Same as C201	2-27
C859		Same as C103	2-9
C860		Same as C272	2-27
C861	3085-93	Capacitor - Fixed, electrolytic, 6.25 uf, -20 +50%, 300 V., metal cased, tubular, axial wire leads, 1/2 in. x 1-3/8 in. (Cornell Dubilier No. BBR6.25-300-2 or equal)	2-27
C862		Same as C855	2-27
C1201		Same as C128	p/o DL1200
C1202	3110-113	Capacitor - Fixed, ceramic, .68 uuf, ±20%, 500 V. (3/16 in. x 5/16 in.) (Stackpole GA-1, insulating type, Stackpole Print No. BP10-401 per code 80-39 or equal)	p/o DL1200
C1203		Same as C1202	p/o DL1200
C1204		Same as C128	p/o DL1200
C1205	3110-111	Capacitor - Fixed, ceramic, 1.5 uuf ± .25 uuf, 500 V. (Erie N330 No. 250A1.5 ± .25 uuf or equal)	p/o DL1200
C1206		Same as C1205	p/o DL1200

p/o =part of

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C1207		Same as C128	p/o DL1200
C1208	3110-105	Capacitor - Fixed, ceramic, 1.0 uuf ±0.2 uuf, 500 V., (Stackpole GA-2, insulated type or equal)	p/o DL1200
C1209		Same as C128	p/o DL1200
C1210		Same as C128	p/o DL1200
C1211		Same as C1202	p/o DL1200
C1212		Same as C1202	p/o DL1200
C1213		Same as C128	p/o DL1200
C1214		Same as C1205	p/o DL1200
C1215		Same as C1205	p/o DL1200
C1217		Same as C128	p/o DL1200
C1218		Same as C128	p/o DL1200
C1219		Same as C128	p/o DL1200
C1220		Same as C128	p/o DL1200
C1221		Same as C1205	p/o DL1200
C1222		Same as C1205	p/o DL1200
C1223		Same as C128	p/o DL1200
C1224		Same as C128	p/o DL1200
C1225		Same as C128	p/o DL1200
C1226		Same as C128	p/o DL1200

p/o=part of

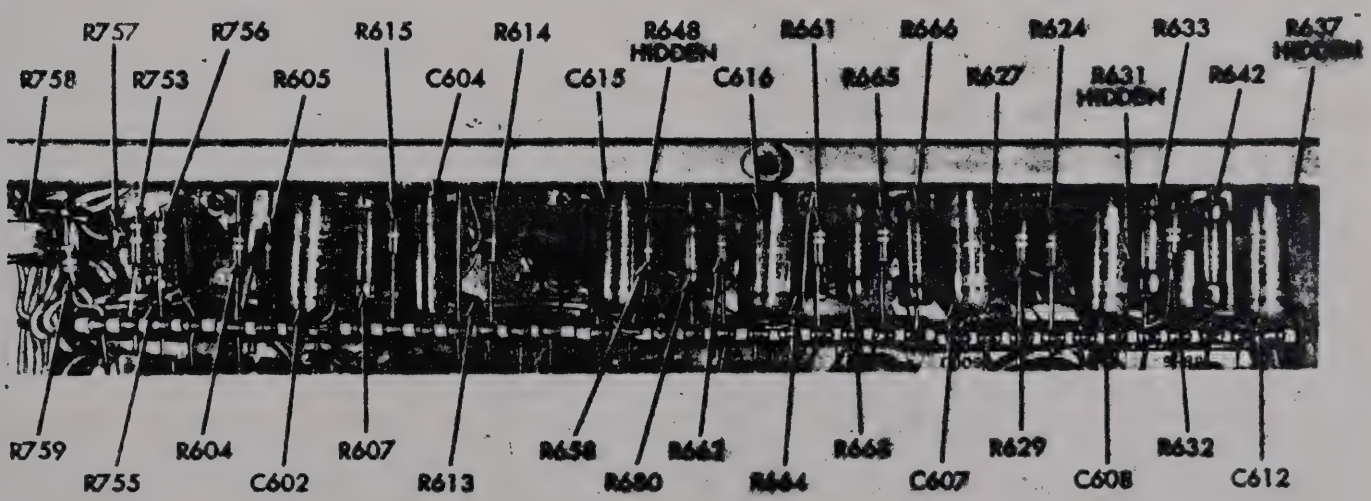


Figure 2-19. Part of Low Voltage Power Supply Showing Location of Components.

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C1227		Same as C1205	p/o DL1200
C1228		Same as C1205	p/o DL1200
C1229		Same as C128	p/o DL1200
C1230		Same as C128	p/o DL1200
C1231		Same as C128	p/o DL1200
C1232		Same as C128	p/o DL1200
C1233		Same as C1205	p/o DL1200
C1234		Same as C1205	p/o DL1200
C1235		Same as C128	p/o DL1200
C1236		Same as C128	p/o DL1200
C1237		Same as C128	p/o DL1200
C1238		Same as C128	p/o DL1200
C1239		Same as C1205	p/o DL1200
C1240		Same as C1205	p/o DL1200
C1241		Same as C128	p/o DL1200
C1242		Same as C128	p/o DL1200
C1243		Same as C128	p/o DL1200
C1244		Same as C128	p/o DL1200
C1245		Same as C1205	p/o DL1200
C1246		Same as C1205	p/o DL1200
C1247		Same as C128	p/o DL1200
C1248		Same as C128	p/o DL1200
C1249		Same as C128	p/o DL1200
C1250		Same as C128	p/o DL1200
C1251		Same as C1205	p/o DL1200
C1252		Same as C1205	p/o DL1200
C1255		Same as C128	p/o DL1200
C1256		Same as C128	p/o DL1200
C1257		Same as C128	p/o DL1200
C1258		Same as C128	p/o DL1200
C1259		Same as C128	p/o DL1200
C1260		Same as C128	p/o DL1200

p/o = part of

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
C1261		Same as C128	p/o DL1200
C1262		Same as C128	p/o DL1200
C1263		Same as C128	p/o DL1200
C1264		Same as C128	p/o DL1200
C1265		Same as C128	p/o DL1200
C1266		Same as C128	p/o DL1200
C1267		Same as C128	p/o DL1200
C1268		Same as C128	p/o DL1200
C1269		Same as C128	p/o DL1200
C1270		Same as C128	p/o DL1200
C1271		Same as C128	p/o DL1200
C1272		Same as C128	p/o DL1200
C1273		Same as C128	p/o DL1200
C1274		Same as C128	p/o DL1200
CR601	3870-101	Crystal - Diode, silicon, 600 PIV, 1 Amp	2-22
CR602		Same as CR601	2-22
CR603		Same as CR601	2-22
CR604		Same as CR601	2-22
CR605		Same as CR601	2-22
CR606		Same as CR601	2-22
CR607		Same as CR601	2-22
CR608		Same as CR601	2-22
CR609		Same as CR601	2-22
CR610		Same as CR601	2-22
CR611		Same as CR601	2-22

p/o=part of

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
CR612		Same as CR601	2-22
CR613		Same as CR601	2-22
CR614		Same as CR601	2-22
CR615		Same as CR601	2-22
CR616		Same as CR601	2-22
DL1200	4115-8	Delay Line Assembly	2-28
DS101	12270-42	Lamp - 1/25 W., ignition voltage 75 V. specially selected for striking voltage from NE-2 stock	2-1
DS102		Same as DS101	2-1
DS601	12270-12	Lamp - No. 47 G. E. radio panel, 6-8 V., 15 Amp, miniature bayonet base	2-26
DS602		Same as DS601	2-1
DS603		Same as DS601	2-1
DS851		Lamp - NE-2 neon, aged 50 hrs, 600 microamperes	2-1
DS852		Same as DS851	2-1
F105		Fuse - 6.25 Amp (Littlefuse #3136.25 SLO-BLO or equal)	2-3
K600	20875-173	Tube - Thermo time delay, Amperite 6N045T	2-4
K601	18400-25	Relay - DC, 8000 ohms, 110 V. DC (Potter and Brumfield type LS2521 or equal)	2-22
L101	3320-160	Coil - Variable, 2.0 - 4.0 uh	2-3
L102		Same as L101	2-3
L103	3320-161	Coil - Variable, .5 - .8 uh	2-3
L104		Same as L103	2-3
L105	3320-167	Coil - Fixed, 16 uh ±5%	2-3
L106	3320-162	Coil - Variable, .5-1 uh	2-2

p/o=part of

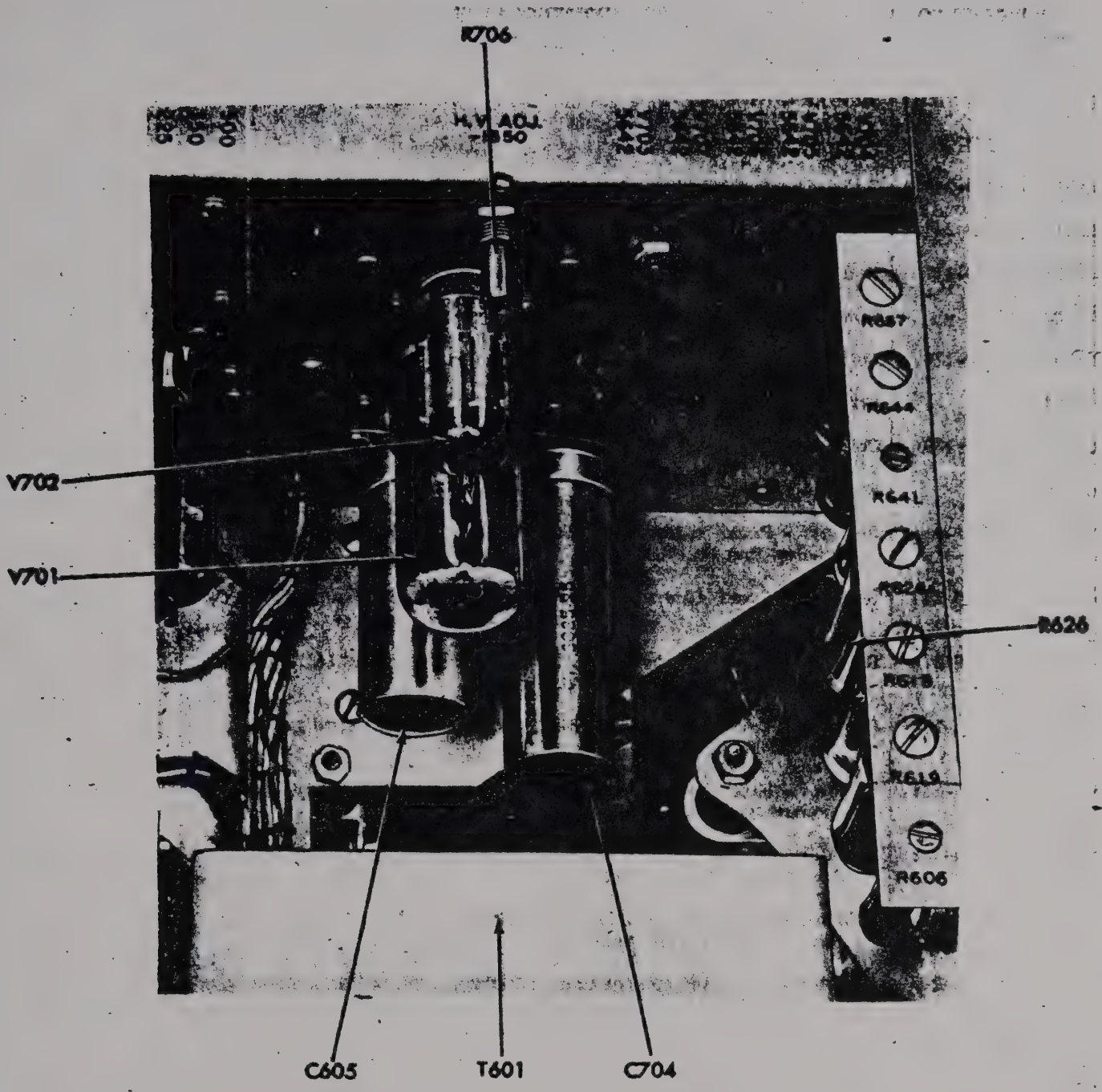


Figure 2-20. Part of Main Chassis Showing Location of Components.

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
L107		Same as L106	2-2
L108	3320-164	Coil - Fixed, plate delay line	2-5
L109	3320-163	Coil - Fixed, grid delay line	2-5

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
L110		Same as L109	2-2
L111		Same as L108	2-2
L251	3320-242	Coil - Fixed, 1.65 mh	2-6
L451	3320-243	Coil - Fixed, 4.10 mh	2-15
L551	3320-244	Coil - Fixed, 250 uh	2-14
L1201	3320-177	Coil - Fixed, delay line	p/o DL1200
L1202		Same as L1201	p/o DL1200
L1203	3320-176	Coil - Fixed, delay line	p/o DL1200
L1204		Same as L1203	p/o DL1200
L1205	3320-169	Coil - Variable, .9-1.6 uh	2-28
L1206		Same as L1205	2-28
R101	18431-911	Resistor - Fixed, composition, 910 ohms, 5%, 2 Watt (Allen Bradley Part No. HB9115)	2-3
R102	18530-220	Resistor - Fixed, film, 499 ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-3
R103	18410-272	Resistor - Fixed, composition, 27 ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB2701)	2-3
R104	18575-228	Resistor - Fixed, wire wound, 3K ohms, 5%, 5 Watt (Ward Leonard type 5X3000 or equal)	2-4
R105	18575-236	Resistor - Fixed, wire wound, 10K ohms, 5%, 10 Watt (Ward Leonard type 1-3/4Z or equal)	2-4
R106	18411-332	Resistor - Fixed, composition, 330 ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB3311)	2-4
R107	18414-472	Resistor - Fixed, composition, 470K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB4741)	2-3
R108	40101-201	Resistor - Variable, composition, 200 ohms, 20%, 2 Watt, linear taper, 3/8 in. bushing length, 7/8 in. shaft from mtg surface, screw driver slot (Allen Bradley type J or equal)	2-3 & 2-4
R109		Same as R106	2-4
R110		Same as R107	2-3
R111		Same as R103	2-3
R112		Same as R102	2-3
R113	18421-102	Resistor - Fixed, composition, 100 ohms, 10%, 1 Watt (Allen Bradley Part No. GB1011)	2-3
R114		Same as R113	2-3
R115	18410-472	Resistor - Fixed, composition, 47 ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB4701)	2-3

p/o = part of

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R116		Same as R115	2-3
R117		Same as R113	2-3
R118	18422-222	Resistor - Fixed, composition, 2200 ohms, 10%, 1 Watt (Allen Bradley Part No. GB2221)	2-3
R119	18525-793	Resistor - Fixed, composition, 68K ohms, 10%, 1/10 Watt (Allen Bradley Part No. TR6831	2-3
R120	18413-472	Resistor - Fixed, composition, 47K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB4731	2-3
R121	18575-232	Resistor - Fixed, wire wound, 2.5K ohms, 1%, 5 Watt (Ward Leonard type 5X2500-1% or equal)	2-3
R122	18433-272	Resistor - Fixed, composition, 27K ohms, 10%, 2 Watt (Allen Bradley Part No. HB2731)	2-3
R123		Same as R122	2-3
R124		Same as R119	2-3
R125		Same as R120	2-3
R126	40101-254	Resistor - Variable, composition, 250K ohms, 20%, 2 Watt, linear taper, 3/8 in. bushing length, 7/8 in. shaft length from mtg surface, screw driver slot (Allen Bradley type J or equal)	2-4
R127	18410-332	Resistor - Fixed, composition, 33 ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB3301)	2-2
R128		Same as R127	2-5
R129		Same as R107	2-2
R130	18575-220	Resistor - Fixed, wire wound, 4500 ohms, 5%, 8 Watt	2-4
R131	18575-237	Resistor - Fixed, wire wound, 167 ohms, 5%, 5 Watt (Ward Leonard type Y167WL, 1 in. x 3/8 in. or equal)	2-3
R132		Same as R107	2-5
R133	18422-201	Resistor - Fixed, composition, 2000 ohms, 5%, 1 Watt (Allen Bradley Part No. GB2025)	2-3
R134	18411-102	Resistor - Fixed, composition, 100 ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB1011)	2-3
R135	18432-472	Resistor - Fixed, composition, 4700 ohms, 10%, 2 Watt (Allen Bradley Part No. HB4721)	2-3
R136	18575-218	Resistor - Fixed, wire wound, 30K ohms, 5%, 10 Watt (Ward Leonard type Z30000 WL or equal)	2-7
R137	18414-152	Resistor - Fixed, composition, 150K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB1541	2-27
R138	18414-332	Resistor - Fixed, composition, 330K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB3341)	2-27
R139	18414-392	Resistor - Fixed, composition, 390K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB3941)	2-3

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R140	18414-682	Resistor - Fixed, composition, 680K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB6841)	2-3
R141		Same as R139	2-3
R142		Same as R134	2-3
R143	18433-152	Resistor - Fixed, composition, 15K ohms, 10%, 2 Watt (Allen Bradley Part No. HB1531)	2-3
R144	18415-102	Resistor - Fixed, composition, 1 megohm, 10%, 1/2 Watt (Allen Bradley Part No. EB1051)	2-26
R145	18455-102	Resistor - Fixed, composition, 1 megohm, 10%, 1/4 Watt (Allen Bradley Part No. CB1051)	2-2
R146	18411-392	Resistor - Fixed, composition, 390 ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB3911)	2-3
R147	18531-36	Resistor - Fixed, film, 178 ohms, 1%, 1 Watt (Electra type DC1 or equal)	2-3
R148	18532-4	Resistor - Fixed, film, 243 ohms, 1%, 2 Watt (Electra type DC2 or equal)	2-3

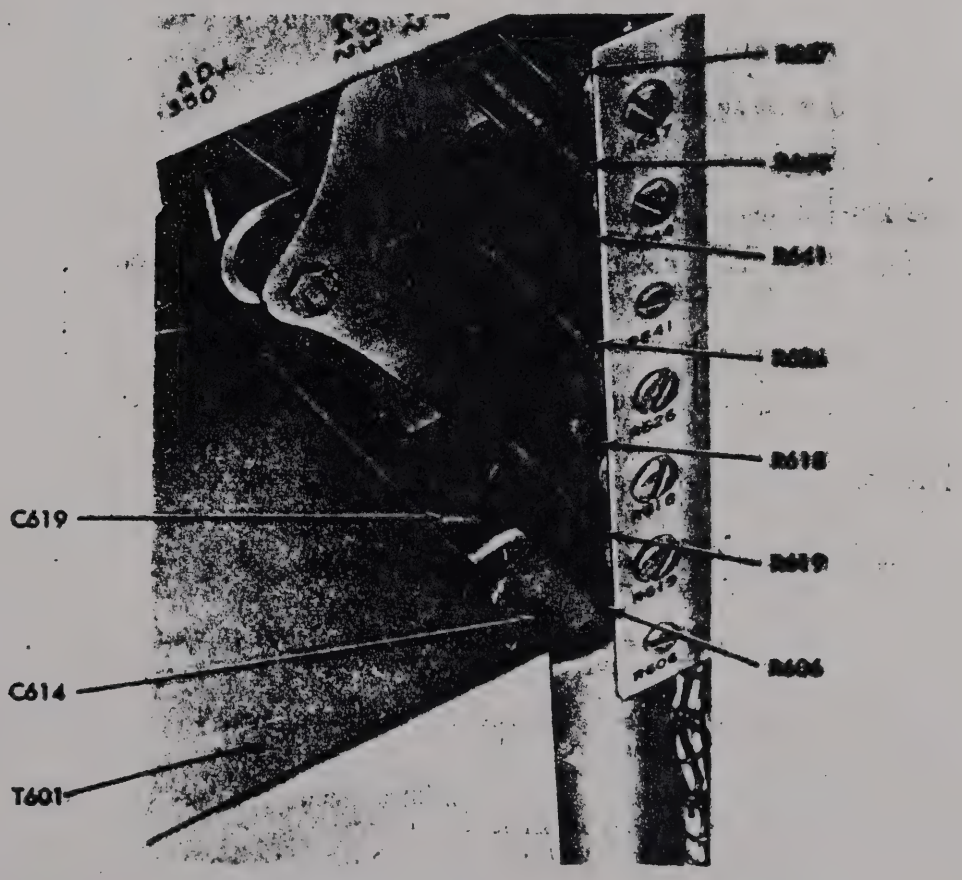


Figure 2-21. Part of Low Voltage Power Supply Showing Location of Components.

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R149		Same as R148	2-3
R150	16925-468	Resistor - Variable, composition, 2K ohms, 20%, 2 Watt, linear taper, 1/2 in. bushing length, 5/8 in. slotted shaft FMS (Allen Bradley type J or equal)	2-3
R151		Same as R145	2-2
R152	18452-822	Resistor - Fixed, composition, 8200 ohms, 10%, 1/4 Watt (Allen Bradley Part No. CB8221)	2-2
R153		Same as R152	2-2
R154		Same as R107	2-2
R155		Same as R130	2-4
R156		Same as R107	2-5
R157		Same as R107	2-5
R158		Same as R130	2-4
R159		Same as R107	2-2
R160		Same as R107	2-2
R161		Same as R130	2-4
R162		Same as R107	2-5
R163		Same as R107	2-5
R164		Same as R130	2-4
R165		Same as R107	2-2
R166		Same as R107	2-2
R167		Same as R130	2-4
R168		Same as R107	2-5
R169		Same as R107	2-5
R170		Same as R130	
R171		Same as R107	2-2
R172	18411-361	Resistor - Fixed, composition, 360 ohms, 5%, 1/2 Watt (Allen Bradley Part No. EB3615)	2-2
R173		Same as R172	2-5
R174	18575-238	Resistor - Fixed, wire wound, 12K ohms, 5%, 8 Watt	2-4
R175	18575-227	Resistor - Fixed, wire wound, 1000 ohms, 5%, 5 Watt (Ward Leonard type 5X1000 or equal)	2-3
R176		Same as R361	2-3
R177		Same as R147	2-3
R178		Same as R148	2-3

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R179		Same as R148	2-3
R180	18412-102	Resistor - Fixed, composition, 1000 ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB1021)	2-26
R200		Same as R103	2-6
R201	18414-102	Resistor - Fixed, composition, 100K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB1041)	2-12
R202	40101-503	Resistor - Variable, composition, 50K ohms, 20%, 2 Watt, linear taper, 3/8 in. bushing length, 7/8 in. shaft length from mtg surface, screw driver slot (Allen Bradley type J or equal)	2-7
R203	18415-101	Resistor - Fixed, composition, 1 megohm, 5%, 1/2 Watt (Allen Bradley Part No. EB1055)	2-6
R204		Same as R139	2-6
R205		Same as R144	2-6
R206		Same as R201	2-6
R207		Same as R107	2-6
R208		Same as R115	2-7
R211	18531-24	Resistor - Fixed, film, 4.99 K ohms, 1%, 1 Watt (Electra type DC1 or equal)	2-7
R212		Same as R211	2-7
R213		Same as R115	2-7
R214	18575-395	Resistor - Fixed, wire wound, 20K ohms, 1%, 3 Watt	2-7
R215	18413-562	Resistor - Fixed, composition, 56K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB5631)	2-6
R216		Same as R107	2-7
R217	16925-458	Resistor - Variable, composition, concentric, front section 100K ohms, 20%, .5 W., rear section 15K ohms, 20%, .5 W., with SPDT switch, linear taper	2-7
R218	18413-222	Resistor - Fixed, composition, 22K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB2231)	2-7
R220		Same as R120	2-7
R221		Same as R120	2-7
R222	18577-211	Resistor - Paired (1.24 megohms)	2-7
R223		Same as R222	2-6
R224		Same as R115	2-7
R225	18530-84	Resistor - Fixed, film, 2100 ohms, 1%, 1 Watt (Electra type DC1 or equal)	2-7
R226	18531-23	Resistor - Fixed, film, 22.1K ohms, 1%, 1 Watt (Electra type DC1 or equal)	2-7

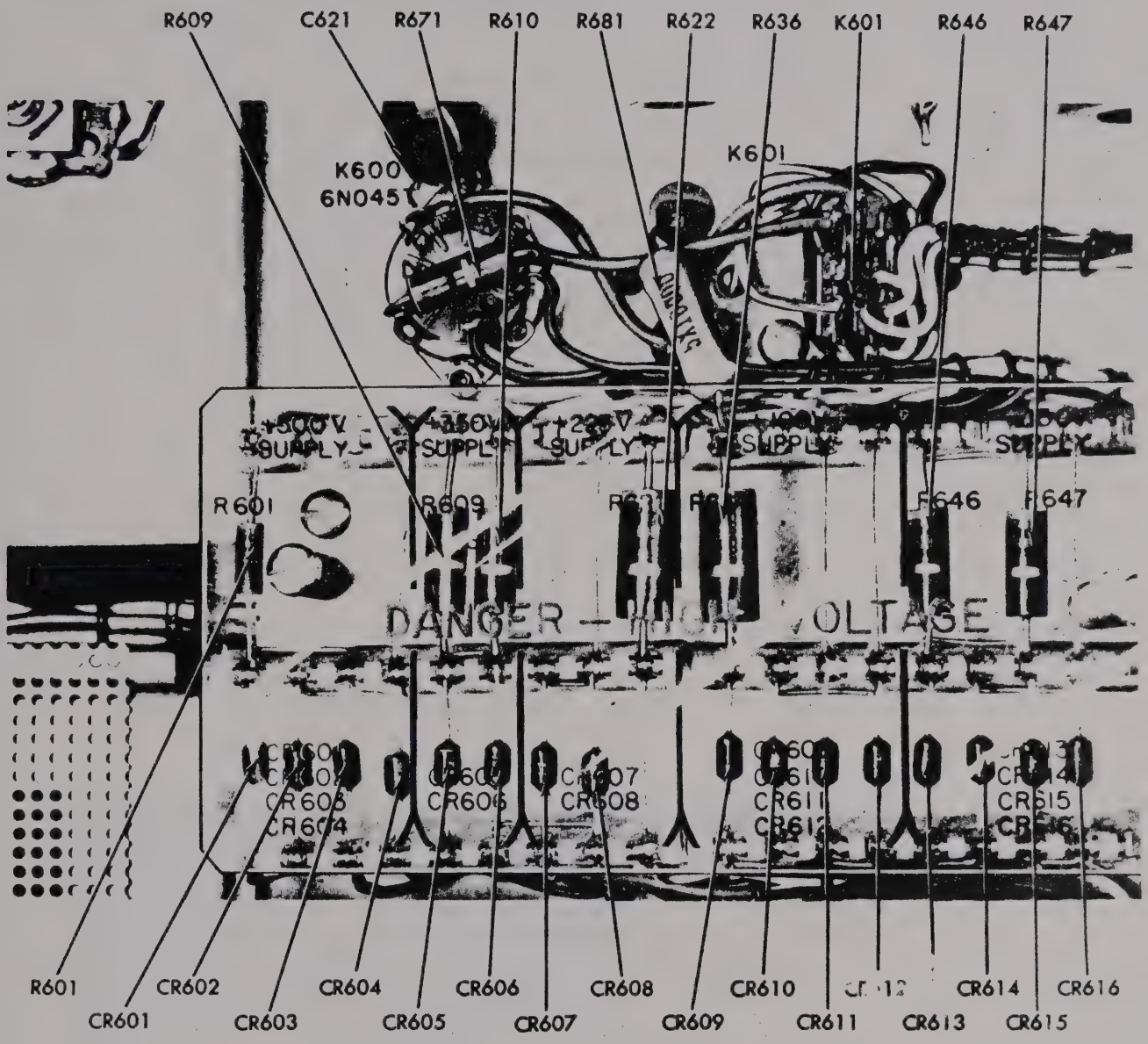


Figure 2-22. Part of Low Voltage Power Supply Showing Location of Components.

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R227	40101-501	Resistor - Variable, composition, 500 ohms, 20%, 2 Watt, linear taper, 3/8 in. bushing length, 7/8 in. shaft from mtg surface, screw driver slot (Allen Bradley type J or equal)	2-7 2-7
R228		Same as R180	2-7
R230		Same as R226	2-7
R231	40101-253	Resistor - Variable, composition, 25K ohms, 20%, 2 Watt, linear taper, 3/8 in. bushing length 7/8 in. shaft length from mtg surface, screw driver slot (Allen Bradley type J or equal)	2-7

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R232		Same as R115	2-7
R233	18525-845	Resistor - Fixed, film, 111K ohms, 1%, 1/2 Watt, 150 ppm/° C, Dalohm or equal	2-6
R234	18530-222	Resistor - Fixed, film, 80.6K ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-7
R235	18525-843	Resistor - Fixed, film, 432K ohms, 1%, 1/2 Watt, 150 ppm/° C, Dalohm or equal	2-7
R236	18525-844	Resistor - Fixed, film, 320K ohms, 1%, 1/2 Watt, 150 ppm/° C, Dalohm or equal	2-7
R237		Same as R144	2-6
R250		Same as R180	2-7 & 2-12
R251		Same as R115	2-6
R252	18531-29	Resistor - Fixed, film, 3K ohms, 1%, 1 Watt (Electra type DC1 or equal)	2-6
R253		Same as R252	2-6

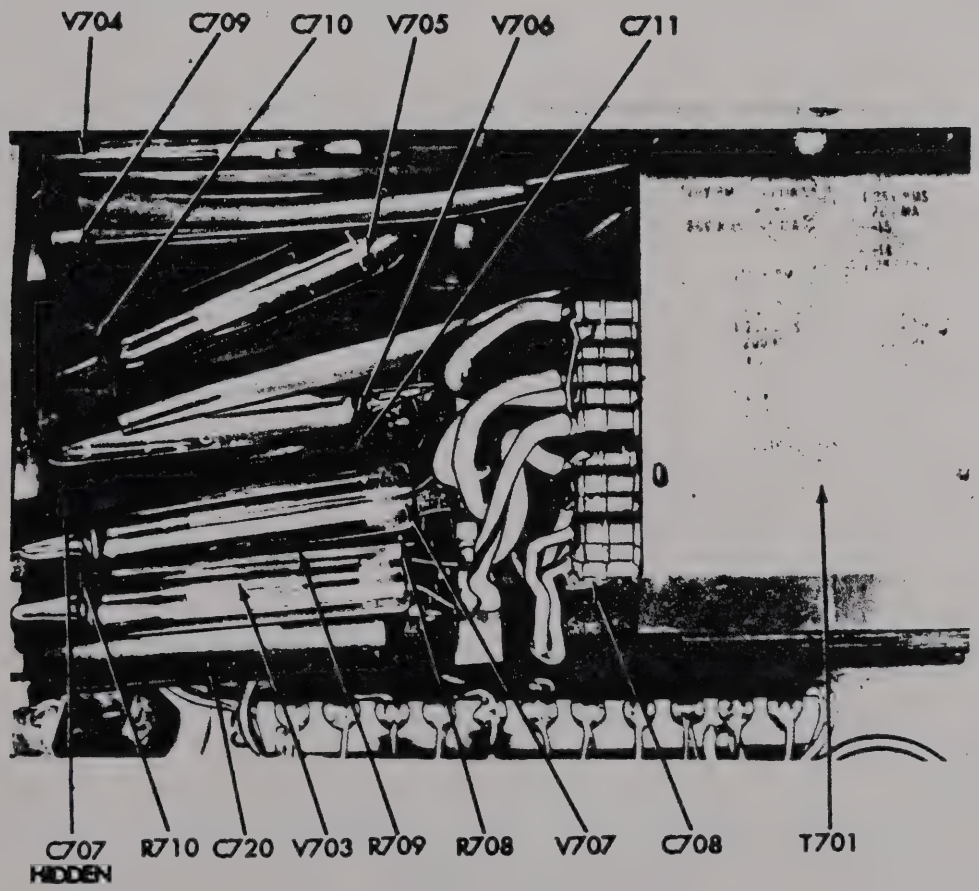


Figure 2-23. High Voltage Power Supply Showing Location of Components.

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R254		Same as R115	2-6
R255		Same as R115	2-6
R256		Same as R214	2-6
R257	18575-398	Resistor - Fixed, wire wound, 15K ohms, 1%, 3 Watt, Dalohm type RS-2-3W or equal	2-6
R258		Same as R115	2-7
R260		Same as R115	2-7
R261	18433-472	Resistor - Fixed, composition, 47K ohms, 10%, 2 Watt (Allen Bradley Part No. HB4731)	2-7
R262		Same as R120	2-7
R263	18414-111	Resistor - Fixed, composition, 110K ohms, 5%, 1/2 Watt (Allen Bradley Part No. EB1145)	2-7
R264		Same as R115	2-7
R265		Same as R115	2-7
R266	18412-332	Resistor - Fixed, composition, 4700 ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB4721)	2-7
R267	18530-22	Resistor - Fixed, film, 100K ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-9
R268	18415-472	Resistor - Fixed, composition, 4.7 megohms, 10%, 1/2 Watt (Allen Bradley Part No. EB4751)	2-7
R270	18530-194	Resistor - Fixed, film, 249K ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-7
R271		Same as R180	2-7
R272	18530-106	Resistor - Fixed, film, 25.5K ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-6
R273		Same as R115	2-6
R274		Same as R115	2-6
R275		Same as R134	2-6
R276	18575-401	Resistor - Fixed, wire wound, 8K ohms, 5%, 3 Watt, Dalohm type RS-2-3W or equal	2-6
R277	18575-402	Resistor - Fixed, wire wound, 9K ohms, 5%, 3 Watt, Dalohm type CS-2B or equal	2-6
R278		Same as R115	2-6
R280	18412-181	Resistor - Fixed, composition, 1800 ohms, 5%, 1/2 Watt (Allen Bradley Part No. EB1825)	2-7
R281		Same as R106	2-7
R282	18413-511	Resistor - Fixed, composition, 51K ohms, 5%, 1/2 Watt (Allen Bradley Part No. EB5135)	2-6

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R283	18575-400	Resistor - Fixed, wire wound, 8K ohms, 1%, 5 Watt, Dalohm type RS-5-5W or equal	2-6
R284	18422-331	Resistor - Fixed, composition, 3.3K ohms, 5%, 1 Watt (Allen Bradley Part No. GB3325)	2-6
R285	18433-222	Resistor - Fixed, composition, 22K ohms, 10%, 2 Watt (Allen Bradley Part No. HB2231)	2-6 & 2-27
R286		Same as R285	2-6 & 2-27
R287		Same as R285	2-6 & 2-27
R288		Same as R120	2-6
R290	18415-152	Resistor - Fixed, composition, 1.5 megohms, 10%, 1/2 Watt (Allen Bradley Part No. EB1551)	2-6
R291		Same as R115	2-6
R292		Same as R115	2-6
R293		Same as R115	2-6
R294		Same as R203	2-6
R295	18414-101	Resistor - Fixed, composition, 100K ohms, 5%, 1/2 Watt (Allen Bradley Part No. EB1045)	2-6
R296		Same as R201	2-6
R297		Same as R115	2-6
R298	18575-224	Resistor - Fixed, wire wound, 8000 ohms, 5%, 5 Watt (Ward Leonard type 5X8000 or equal)	2-7

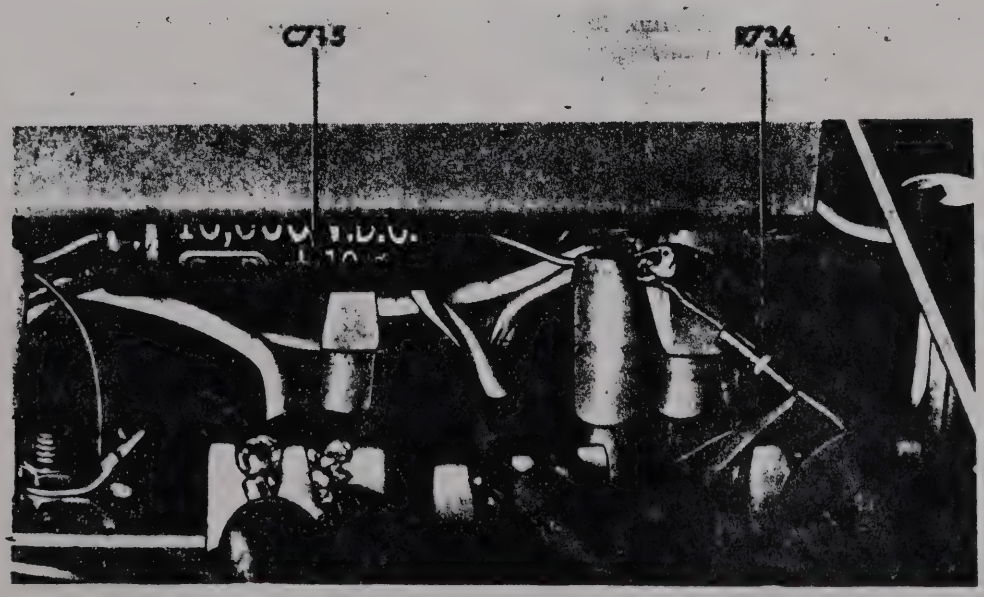


Figure 2-24. High Voltage Power Supply Showing Location of Components.

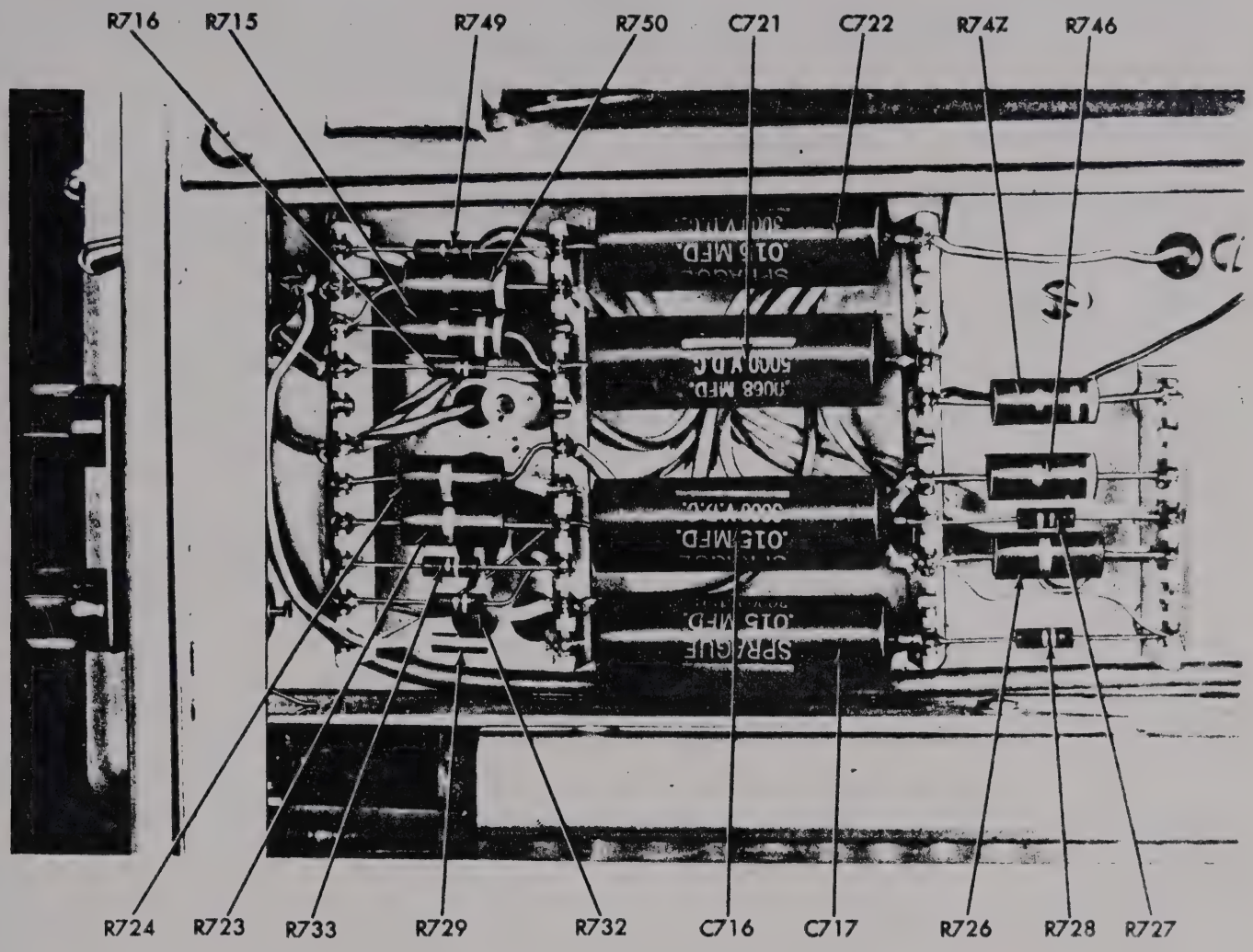


Figure 2-25. Part of High Voltage Power Supply Showing Location of Components.

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R300		Same as R144	2-7
R301	18575-228	Resistor - Fixed, wire wound, 4000 ohms, 5%, 5 Watt (Ward Leonard type 5X4000 or equal)	2-7
R302	18424-102	Resistor - Fixed, composition, 100K ohms, 10%, 1 Watt (Allen Bradley Part No. GB1041)	2-6
R303	18530-195	Resistor - Fixed, film, 499K ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-7
R305		Same as R180	2-7
R306		Same as R115	2-7

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R307	18530-219	Resistor - Fixed, film, 453K ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-7
R308	18530-20	Resistor - Fixed, film, 150K ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-7
R310		Same as R143	2-7
R311	16925-460	Resistor - Variable, composition, 15K ohms, 10%, .5 W., linear taper, 1/4 in. bushing length, 1/8 in. slotted shaft (Chicago Telephone type 65 or equal)	2-7
R312	18530-54	Resistor - Fixed, film, 7500 ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-7
R313		Same as R217	2-7
R314		Same as R180	2-6
R315		Same as R218	2-6
R316	18416-222	Resistor - Fixed, composition, 22 megohms, 10%, 1/2 Watt (Allen Bradley Part No. EB2261)	2-6
R317		Same as R139	2-6
R318		Same as R144	2-6
R320		Same as R115	2-6
R321	18414-222	Resistor - Fixed, composition, 220K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB2241)	2-6
R322	18531-31	Resistor - Fixed, film, 100K ohms, 1%, 1 Watt (Electra type DC1 or equal)	2-6
R323		Same as R322	2-6
R324		Same as R139	2-6
R325	18414-562	Resistor - Fixed, composition, 560K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB5641)	2-12
R326		Same as R303	2-6
R327		Same as R115	2-6
R328	18530-49	Resistor - Fixed, film, 118K ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-6 2-12
R329		Same as R120	
R330	18531-28	Resistor - Fixed, film, 5.90K ohms, 1%, 1 Watt (Electra type DC1 or equal)	2-6
R331		Same as R180	2-6
R332		Same as R115	2-6
R333	18413-681	Resistor - Fixed, composition, 68K ohms, 5%, 1/2 Watt (Allen Bradley Part No. EB6835)	2-6

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R334	18413-102	Resistor - Fixed, composition, 10K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB1031)	2-7
R335		Same as R203	2-6
R336		Same as R107	2-7
R337	18432-332	Resistor - Fixed, composition, 3300 ohms, 10%, 2 Watt (Allen Bradley Part No. HB3321)	2-7
R338		Same as R180	2-7
R340	18415-182	Resistor - Fixed, composition, 1.8 megohms, 10%, 1/2 Watt (Allen Bradley Part No. EB1851)	2-7
R341	40101-202	Resistor - Variable, composition, 2000 ohms, 20%, 2 Watt.	2-7
R351	18415-361	Resistor - Fixed, composition, 5.6 megohms, 5%, 1/2 Watt (Allen Bradley Part No. EB5655)	2-8
R352		Same as R303	2-8
R353	18415-201	Resistor - Fixed, composition, 2 megohms, 5%, 1/2 Watt (Allen Bradley Part No. EB2055)	2-8
R355		Same as R144	2-9
R356		Same as R201	2-9
R357		Same as R334	
R358	16925-403	Resistor - Variable, wire wound, 20K ohms, 10%, 2 W., with SPDT switch (Clarostat Series 43C2-20K, off in clockwise position or equal)	2-9
R360	16925-461	Resistor - Variable, composition, 500 ohms, 10%, .5 W., linear taper, 1/4 in. bushing length, 1/8 in. slotted shaft (Chicago Telephone type 65 or equal)	2-9
R361	18423-562	Resistor - Fixed, composition, 56K ohms, 10%, 1 Watt (Allen Bradley Part No. GB5631)	2-9
R362	18532-2	Resistor - Fixed, film, 30 megohms, 1%, 2 Watt (Electra type DC2 or equal)	2-8
R363	18531-1	Resistor - Fixed, film, 10 megohms, 1%, 1 Watt (Electra type DC1 or equal)	2-8
R364		Same as R363	2-8
R365	18530-198	Resistor - Fixed, film, 4.99 megohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-8
R366	18530-24	Resistor - Fixed, film, 2 megohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-8
R367	18530-95	Resistor - Fixed, film, 1 megohm, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-8
R368		Same as R303	2-8
R370	18530-29	Resistor - Fixed, film, 200K ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-8

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R371		Same as R267	2-8
R398		Same as R115	2-15
R399		Same as R115	2-14
R400		Same as R103	2-12
R401		Same as R201	2-11
R402	16925-459	Resistor - Variable, composition, 50K ohms, 10%, .5 W., 1/4 in. bushing length, 1/8 in. slotted shaft, linear taper (Chicago Telephone type 65 or equal)	2-11 & 2-14
R403		Same as R139	2-12
R404		Same as R203	2-12
R405		Same as R144	2-12
R406		Same as R107	2-12
R407		Same as R115	2-15
R408		Same as R360	2-11 & 2-15
R410	18575-397	Resistor - Fixed, wire wound, 30K ohms, 1%, 5 Watt	2-15
R411	18575-399	Resistor - Fixed, wire wound, 50K ohms, 3%, 5 Watt	2-15
R412		Same as R115	2-15
R413		Same as R215	2-12
R414		Same as R107	2-12
R415	16925-463	Resistor - Variable, composition, concentric, front section 100K ohms, 20%, 1/2 Watt, rear section 5K ohms, 20%, 1/2 Watt, with SPDT switch linear taper	2-12
R416		Same as R218	2-12
R417		Same as R321	2-15
R418		Same as R321	2-15
R419	16925-465	Resistor - Variable, composition, 1000 ohms, 10%, .5 Watt, linear taper, 1/4 in. bushing length, 1/8 in. slotted shaft (Chicago Telephone type 65 or equal)	2-11 & 2-14
R420	18577-212	Resistor - Paired, 4.99 megohms	2-15
R421		Same as R420	2-15
R422		Same as R115	2-15
R424		Same as R280	2-15
R425	18577-213	Resistor - Paired, 249K ohms	2-15
R426		Same as R425	2-15
R427		Same as R115	2-15

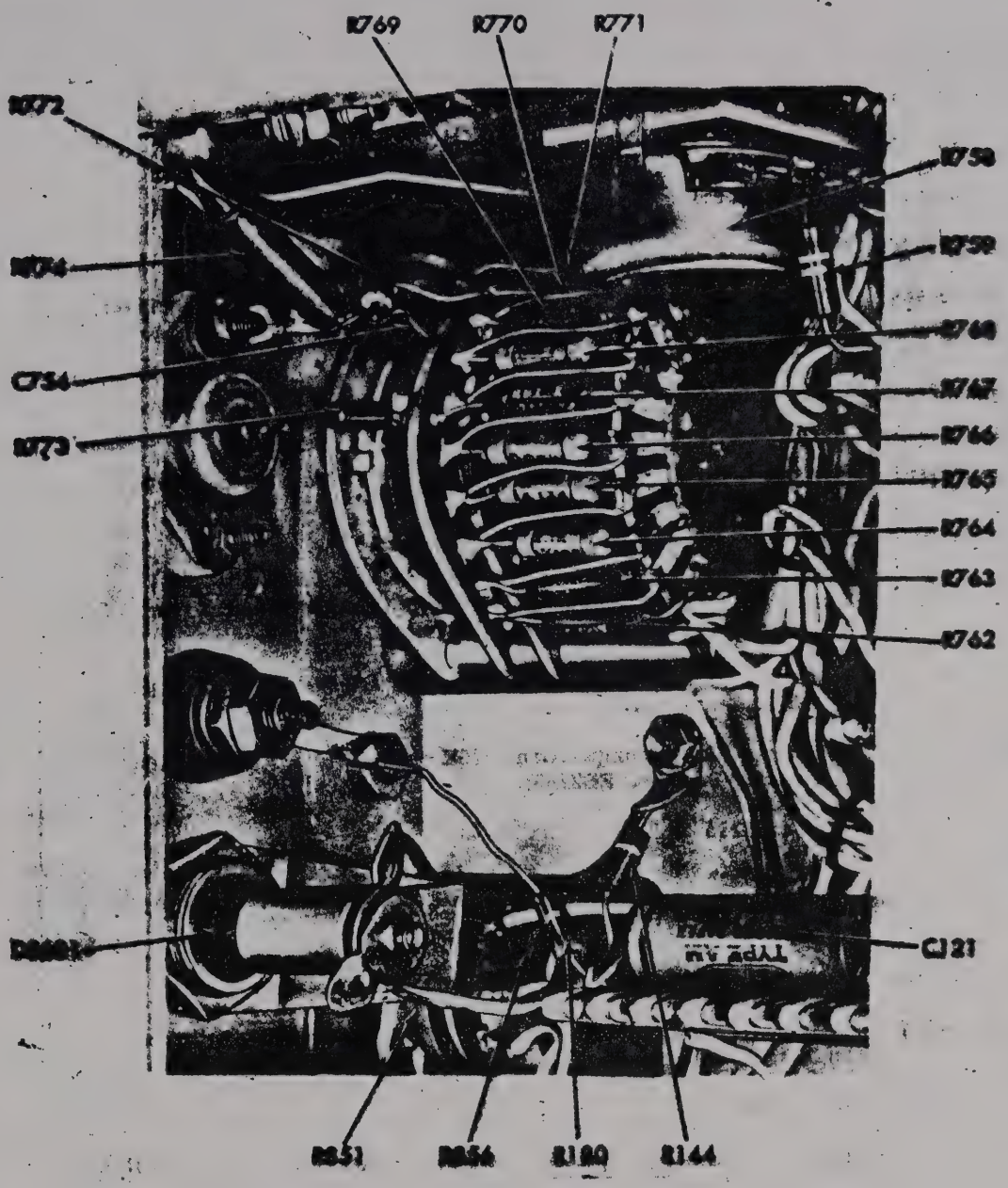


Figure 2-26. Calibrator Switch Showing Location of Components.

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R428	18411-682	Resistor - Fixed, composition, 680 ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB6811)	2-15
R429		Same as R466	2-15
R430	18411-822	Resistor - Fixed, composition, 820 ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB8211)	2-12
R432		Same as R365	2-10
R433	18525-849	Resistor - Fixed, film, 1 megohm, 1%, 1/2 Watt	2-10 & 2-17
R434	18525-850	Resistor - Fixed, film, 600K ohms, 1%, 1/2 Watt	2-10 & 2-17

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R435	18525-851	Resistor - Fixed, film, 400K ohms, 1%, 1/2 Watt	2-10 & 2-17
R436	18525-846	Resistor - Fixed, film, 10 megohms, 1%, 1/2 Watt	2-10 & 2-17
R437	18525-847	Resistor - Fixed, film, 6 megohms, 1%, 1/2 Watt	2-10 & 2-17
R438	18525-848	Resistor - Fixed, film, 4 megohms, 1%, 1/2 Watt	2-10 & 2-17
R447	16925-464	Resistor - Variable, composition, 10K ohms, 10%, .5 Watt, linear taper, 1/4 in. bushing length, 1/8 in. slotted shaft (Chicago Telephone type 65 or equal)	2-12
R448	18530-181	Resistor - Fixed, film, 30.1K ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-15
R450	18530-161	Resistor - Fixed, film, 49.9K ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-15
R451		Same as R115	2-15
R452	18530-220	Resistor - Fixed, film, 5.6K ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-15
R453	18530-202	Resistor - Fixed, film, 4.99K ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-15
R454	18414-271	Resistor - Fixed, composition, 270K ohms, 5%, 1/2 Watt (Allen Bradley Part No. EB2745)	2-15
R455		Same as R115	2-15
R456		Same as R115	2-15
R457		Same as R257	2-15
R458	18575-396	Resistor - Fixed, wire wound, 11K ohms, 1%, 3 Watt	2-15
R460	18530-217	Resistor - Fixed, film, 2.49K ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-12
R461		Same as R415	2-12
R462	18415-122	Resistor - Fixed, composition, 1.2 megohms, 10%, 1/2 Watt (Allen Bradley Part No. EB1251)	2-15
R463		Same as R115	2-15
R464	18433-822	Resistor - Fixed, composition, 82K ohms, 10%, 2 Watt (Allen Bradley Part No. HB8231)	2-15
R465	18413-392	Resistor - Fixed, composition, 39K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB3931)	2-15
R466	18413-332	Resistor - Fixed, composition, 33K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB3331)	2-15
R467		Same as R218	2-15
R468	18415-621	Resistor - Fixed, composition, 6.2 megohms, 5%, 1/2 Watt (Allen Bradley Part No. EB6255)	2-15
R470		Same as R115	2-15

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R471		Same as R201	2-15
R472		Same as R115	2-15
R473		Same as R334	2-15
R474		Same as R115	2-15
R475	18413-751	Resistor - Fixed, composition, 75K ohms, 5%, 1/2 Watt (Allen Bradley Part No. EB7535)	2-15
R476	18412-271	Resistor - Fixed, composition, 2700 ohms, 5%, 1/2 Watt (Allen Bradley Part No. EB2725)	2-15
R477	18412-822	Resistor - Fixed, composition, 8200 ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB8221)	2-15
R478		Same as R257	2-15
R480		Same as R267	2-15
R481		Same as R367	2-15
R482		Same as R115	2-15
R483	18434-222	Resistor - Fixed, composition, 220K ohms, 10%, 2 Watt (Allen Bradley Part No. HB2241)	2-15
R484	18423-222	Resistor - Fixed, composition, 22K ohms, 10%, 1 Watt (Allen Bradley Part No. GB2231)	2-15
R485		Same as R115	2-15
R486		Same as R143	2-15
R487		Same as R290	2-15
R488		Same as R201	2-15
R490		Same as R115	2-15
R494	18433-122	Resistor - Fixed, composition, 12K ohms, 10%, 2 Watt (Allen Bradley Part No. HB1231)	2-15
R495	16925-357	Resistor - Variable, wire wound, 10K ohms, 10%, 2 Watt, 3/8 in. bushing length, 1/2 in. shaft length from end of bushing, screw driver slot (Clarastat 43M, welded ends or equal)	2-13
R497		Resistor - Fixed	2-15
R498		Resistor - Fixed	2-15
R551		Same as R144	2-14
R552		Same as R115	2-14
R553		Same as R201	2-14
R554		Same as R120	2-14
R555		Same as R115	2-14
R556		Same as R120	2-14
R557	18413-122	Resistor - Fixed, composition, 12K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB1231)	2-14

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R558		Same as R334	2-14
R560		Same as R334	2-14
R561		Same as R115	2-14
R562	18575-403	Resistor - Fixed, wire wound, 13K ohms, 3%, 5 Watt	2-14
R563		Same as R495	2-11

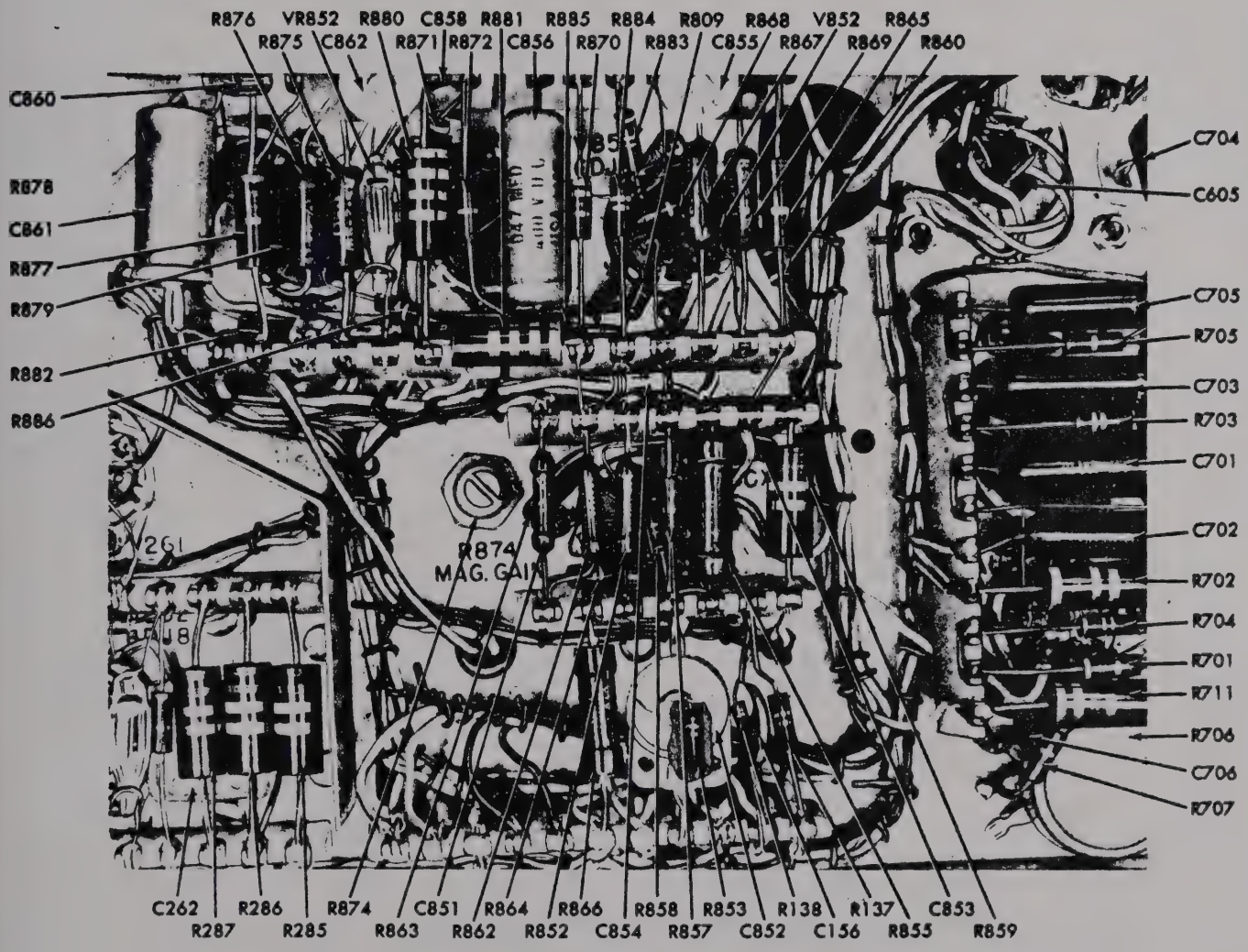


Figure 2-27. Part of Top Chassis Showing Location of Components.

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R564	16925-362	Resistor - Variable, 30,000 ohms, 3 Watt, .1%, linearity (Beckman/ Helipot Corp. type AR30KL.1, resistance tolerance ±3% or equal)	2-16
R565	16925-397	Resistor - Variable, wire wound, 2000 ohms, 10%, 2 Watt, welded ends, 3/8 in. bushing length, 1/2 in. shaft from end of bushing, screw driver slot (Clarostat type 43M or equal)	2-11
R566	18575-404	Resistor - Fixed, wire wound, 11K ohms, 3%, 5 Watt	2-14
R567		Same as R115	2-14
R568	18412-272	Resistor - Fixed, composition, 2700 ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB2721)	2-14
R569		Same as R102	2-14
R570	18530-88	Resistor - Fixed, film, 95,000 ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-14
R571		Same as R308	2-14
R572	18433-392	Resistor - Fixed, composition, 39K ohms, 10%, 2 Watt (Allen Bradley Part No. HB3931)	2-14
R573		Same as R201	2-12
R574		Same as R115	2-14
R575	18412-332	Resistor - Fixed, composition, 3300 ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB3321)	2-14
R576		Same as R334	2-14
R577		Same as R454	2-14
R578		Same as R115	2-14
R580		Same as R115	2-14
R581		Same as R180	2-12
R600	18575-407	Resistor - Fixed, wire wound, 30 ohms, 5%, 3 Watt	p/o (37)1-10
R601	18410-102	Resistor - Fixed, composition, 10 ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB1001)	2-22
R602	18413-272	Resistor - Fixed, composition, 27K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB2731)	2-18
R603	18414-122	Resistor - Fixed, composition, 120K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB1241)	2-18
R604		Same as R137	2-19
R605		Same as R144	2-19
R606	18575-406	Resistor - Fixed, wire wound, 4500 ohms, 5%, 8 Watt (Ward Leonard 04500 Vitrohm or equal)	2-21
R607	18550-199	Resistor - Fixed, film, 221K ohms, 1%, 1 Watt 150 ppm/° C	2-19
R608	18531-34	Resistor - Fixed, film, 725K ohms, 1%, 1 Watt (Electra type DC1 or equal)	2-18

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R609	18420-102	Resistor - Fixed, composition, 10 ohms, 10%, 1 Watt (Allen Bradley Part No. GB1001)	2-22
R610		Same as R609	2-22
R611		Same as R464	2-18
R612		Same as R325	2-18
R613		Same as R120	2-19
R614		Same as R144	2-19
R615		Same as R290	2-19
R616		Same as R180	2-18
R618	18575-286	Resistor - Fixed, wire wound, 2.4K ohms, 5%, 25 Watt (Ward Leonard A2400 Vitrohm or equal)	2-21
R619		Same as R618	2-21
R620		Same as R608	2-18
R621	18530-223	Resistor - Fixed, film, 307K ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-18
R622	18430-102	Resistor - Fixed, composition, 10 ohms, 10%, 2 Watt (Allen Bradley Part No. HB1001)	2-22
R623		Same as R144	2-18
R624		Same as R215	2-19
R625		Same as R290	2-18
R626	18575-285	Resistor - Fixed, wire wound, 1.5K ohms, 5%, 25 Watt (Ward Leonard type 25F1500 or equal)	2-20 & 2-21
R627		Same as R290	2-19
R628	18415-222	Resistor - Fixed, composition, 2.2 megohms, 10%, 1/2 Watt (Allen Bradley Part No. EB2251)	2-18
R629	18414-182	Resistor - Fixed, composition, 180K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB1841)	2-19
R630	18423-822	Resistor - Fixed, composition, 82K ohms, 10%, 1 Watt (Allen Bradley Part No. GB8231)	2-18
R631		Same as R180	2-19
R632		Same as R603	2-19
R633	18550-197	Resistor - Fixed, film, 335K ohms, 1%, 1 Watt, 150 ppm/° C	2-19
R634		Same as R607	2-18
R635	18414-272	Resistor - Fixed, composition, 270K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB2741)	2-3 & 2-18
R636		Same as R622	2-22
R637		Same as R120	2-19

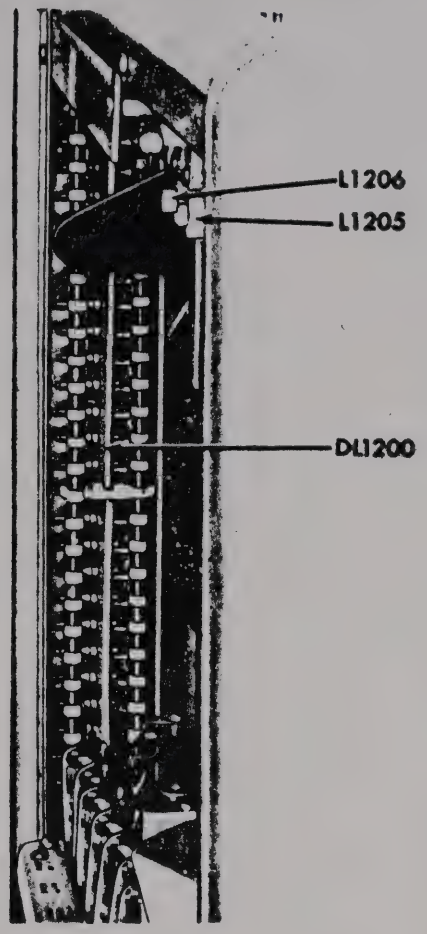


Figure 2-28. Delay Line Assembly Showing Location of Components.

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R638		Same as R140	2-18
R639		Same as R465	2-18
R640		Same as R290	2-18
R641	18575-284	Resistor - Fixed, wire wound, 1.5K ohms, 5%, 10 Watt (Ward Leonard type 10F1500 or equal)	2-21
R642		Same as R633	2-19
R643	18550-198	Resistor - Fixed, film, 494K ohms, 1%, 1 Watt, 150 ppm/° C	2-18
R644	18575-283	Resistor - Fixed, wire wound, 750 ohms, 5%, 25 Watt (Ward Leonard type 25F750 or equal)	2-21
R646		Same as R609	2-22
R647		Same as R609	2-22
R648		Same as R602	2-19
R649		Same as R137	2-18

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R650	18413-682	Resistor - Fixed, composition, 68K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB6831)	2-18
R651	18423-152	Resistor - Fixed, composition, 15K ohms, 10%, 1 Watt (Allen Bradley Part No. GB1531)	2-18
R652		Same as R651	2-18
R653	18415-272	Resistor - Fixed, composition, 2.7 megohms, 10%, 1/2 Watt (Allen Bradley Part No. EB2751)	2-18
R654		Same as R180	2-18
R655		Same as R180	2-18
R656		Same as R144	2-18
R657	18575-405	Resistor - Fixed, wire wound, 800 ohms, 5%, 25 Watt (Ward Leonard type 25F800 or equal)	2-21
R658		Same as R653	2-19
R660		Same as R466	2-18
R661		Same as R201	2-19
R662		Same as R107	2-14
R663		Same as R201	2-18
R664		Same as R180	2-19
R665		Same as R201	2-19
R666	18531-30	Resistor - Fixed, film, 68.1K ohms, 1%, 1 Watt (Electra type DC1 or equal)	2-19
R667	40101-103	Resistor - Variable, composition, 10,000 ohms, 20%, 2 Watt, linear taper, 3/8 in. bushing length, 7/8 in. shaft length from mtg surface, screw driver slot (Allen Bradley type J or equal)	2-17
R668	18531-32	Resistor - Fixed, film, 49.9K ohms, 1%, 1 Watt (Electra type DC1 or equal)	2-19
R669		Same as R601	2-6
R670	16925-351	Resistor - Variable, wire wound, 50 ohms, 10%, 2 Watt, 3/8 in. bushing length, 7/8 in. shaft fms (Clarostat 43C1 or equal)	1-10(37)
R671	18420-122	Resistor - Fixed, composition, 12 ohms, 10%, 1 Watt (Allen Bradley Part No. GB1201)	2-22
R678	18413-152	Resistor - Fixed, composition, 15K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB1531)	2-18
R680	18575-409	Resistor - Fixed, wire wound, 1.5 ohms, 5%, 10 Watt (Ward Leonard type 10F1.5 or equal)	2-4 & 2-19
R681	18575-225	Resistor - Fixed, wire wound, 10K ohms, 5%, 5 Watt (Ward Leonard type 5X10000 or equal)	2-22
R682		Same as R180	2-18

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R683	18530-218	Resistor - Fixed, film, 221K ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-18
R684		Same as R267	2-18
R685		Same as R120	2-18
R686		Same as R303	2-4
R687		Same as R140	2-12
R688		Same as R328	2-18
R689		Same as R137	
R701		Same as R266	2-27
R702		Same as R261	2-27
R703		Same as R201	2-27
R704		Same as R107	2-27
R705		Same as R180	2-27
R706	40101-205	Resistor - Variable, composition, 2 megohms, 20%, 2 Watt, linear taper, 3/8 in. bushing length, 7/8 in. shaft length from mtg surface, screw driver slot (Allen Bradley type J or equal)	2-20 & 2-27
R707		Same as R628	2-27
R708		Same as R268	2-23
R709		Same as R268	2-23
R710		Same as R268	2-23
R711	18431-391	Resistor - Fixed, composition, 390 ohms, 5%, 2 Watt (Allen Bradley Part No. HB3915)	2-27
R715	18435-391	Resistor - Fixed, composition, 3.9 megohms, 5%, 2 Watt (Allen Bradley Part No. HB3955)	2-25
R716		Same as R201	2-25
R723	18435-222	Resistor - Fixed, composition, 2.2 megohms, 10%, 2 Watt (Allen Bradley Part No. HB2251)	2-25
R724		Same as R723	2-25
R725	16925-347	Resistor - Variable, composition, 2 megohms, 20%, 1/2 Watt, insulating bushing (Clarostat HV pot. or equal)	
R726	18435-102	Resistor - Fixed, composition, 1 megohm, 10%, 2 Watt (Allen Bradley Part No. HB1051)	2-25
R727		Same as R334	2-25
R728		Same as R602	2-25
R729		Same as R144	2-25
R730		Same as R202	

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R731	40101-104	Resistor - Variable, composition, 100K ohms, 20%, 2 Watt, linear taper, 3/8 in. bushing length, 7/8 in. shaft fms, screw driver slot (Allen Bradley type J or equal)	2-7
R732		Same as R201	2-25
R733		Same as R201	2-25
R736		Same as R144	2-24
R745	40101-255	Resistor - Variable, composition, 2.5 megohms, 20%, 2 Watt, linear taper, 3/8 in. bushing length, 7/8 in. shaft length from mtg surface, screw driver slot (Allen Bradley type J or equal)	2-7
R746	18435-471	Resistor - Fixed, composition, 4.7 megohms, 5%, 2 Watt (Allen Bradley Part No. HB4755)	2-25
R747	18435-331	Resistor - Fixed, composition, 3.3 megohms, 5%, 2 Watt (Allen Bradley Part No. HB3355)	2-25
R748	16925-346	Resistor - Variable, composition, 1 megohm, 20%, 1/2 Watt, insulating bushing (Clarostat HV pot. or equal)	
R749		Same as R144	2-25
R750		Same as R746	2-25
R752		Same as R180	2-18
R753		Same as R653	2-19
R754	18415-392	Resistor - Fixed, composition, 3.9 megohms, 10%, 1/2 Watt (Allen Bradley Part No. EB3951)	2-18
R755		Same as R180	2-19
R756		Same as R295	2-19
R757	18423-392	Resistor - Fixed, composition, 39K ohms, 10%, 1 Watt (Allen Bradley Part No. GB3931)	2-19
R758		Same as R667	2-19 & 2-26
R759		Same as R201	2-19 & 2-26
R761		Same as R115	2-18
R762	18530-80	Resistor - Fixed, film, 9500 ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-26
R763	18530-82	Resistor - Fixed, film, 6370 ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-26
R764		Same as R225	2-26
R765	18530-86	Resistor - Fixed, film, 1020 ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-26
R766	18530-74	Resistor - Fixed, film, 610 ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-26
R767	18530-75	Resistor - Fixed, film, 200 ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-26

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R768	18530-76	Resistor - Fixed, film, 100 ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-26
R769	18530-77	Resistor - Fixed, film, 60 ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-26
R770	18530-78	Resistor - Fixed, film, 40 ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-26
R771		Same as R267	2-26
R772		Same as R768	2-26
R773		Same as R134	2-26
R774	18577-156	Resistor - 1/4 ohm	2-26
R801		Same as R115	2-12
R802	18530-4	Resistor - Fixed, film, 900K ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-12
R803	18530-89	Resistor - Fixed, film, 111K, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-12
R804		Same as R180	2-14
R805		Same as R144	2-14
R806		Same as R572	2-14
R808		Same as R572	2-14
R809		Same as R201	2-27
R810	40101-153	Resistor - Variable, composition, 15,000 ohms, 20%, 2 Watt, linear taper, 3/8 in. bushing length, 7/8 in. shaft length from mtg surface, screw driver slot (Allen Bradley type J or equal)	2-16
R813		Same as R731	2-11
R814		Same as R321	2-14
R815		Same as R575	2-14
R816		Same as R134	2-14
R817		Same as R122	2-14
R851	16925-466	Resistor - Variable, composition, concentric, front and rear sections each 200K ohms, 20 %, 2 Watt, linear taper, 3/8 in. bushing length, outer shaft length 3/4 in. fms, inner shaft length 1-1/4 in. fms (Allen Bradley type J)	2-26
R852		Same as R365	2-27
R853	18530-197	Resistor - Fixed, film, 1.5 megohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-27
R855		Same as R363	2-27
R856		Same as R851	2-26
R857	18412-222	Resistor - Fixed, composition, 2200 ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB2221)	2-27

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R858		Same as R134	2-27
R859	18433-562	Resistor - Fixed, composition, 56,000 ohms, 10%, 2 Watt (Allen Bradley Part No. HB5631)	2-27
R860		Same as R115	2-27
R861	18530-112	Resistor - Fixed, film, 12.1K ohms, 1%, 1/2 Watt (Electra type DC1/2A or equal)	2-9
R862		Same as R267	2-27
R863		Same as R272	2-27
R864		Same as R134	2-27
R865	18422-821	Resistor - Fixed, composition, 8200 ohms, 5%, 1 Watt (Allen Bradley Part No. GB8225)	2-27
R866	18531-27	Resistor - Fixed, film, 1.91K ohms, 1%, 1 Watt (Electra type DC1 or equal)	2-27
R867		Same as R458	2-27
R868		Same as R115	2-27
R869		Same as R458	2-27
R870		Same as R146	2-27
R871		Same as R115	2-27
R872		Same as R857	2-27
R873	16925-467	Resistor - Variable, composition, 50K ohms, 20%, 2 Watt, linear taper, 1/2 in. bushing length, 5/8 in. slotted shaft fms (Allen Bradley type J or equal)	2-9
R874	40101-252	Resistor - Variable, composition, 2500 ohms, 20%, 2 Watt, linear taper, 3/8 in. bushing length, 7/8 in. shaft from mtg surface, screw driver slot (Allen Bradley type J or equal)	2-27
R875		Same as R458	2-27
R876		Same as R458	2-27
R877		Same as R865	2-27
R878		Same as R115	2-27
R879		Same as R134	2-27
R880		Same as R572	2-27
R881		Same as R572	2-27
R882		Same as R134	2-27
R883		Same as R107	2-27
R884	18414-822	Resistor - Fixed, composition, 820K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB8241)	2-27

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
R885		Same as R884	2-27
R886		Same as R107	2-27
R887		Same as R231	2-7
R888	18413-822	Resistor - Fixed, composition, 82K ohms, 10%, 1/2 Watt (Allen Bradley Part No. EB8231)	2-7
R890		Same as R263	2-7
R891		Same as R201	2-16
R1201		Same as R180	p/o DL1200
R1202		Same as R180	p/o DL1200
R1203		Same as R180	p/o DL1200
R1204		Same as R180	p/o DL1200
R1205		Same as R180	p/o DL1200
R1206		Same as R180	p/o DL1200
R1207		Same as R180	p/o DL1200
R1208		Same as R180	p/o DL1200
T601	20800-293	Transformer, Power	2-20 & 2-21
T602	20800-292	Transformer, Fan power supply	2-3
T701	20800-294	Transformer, CRT supply	2-23
V101	20877-27	Tube - Selected and paired 12BY7A	2-4
V102		Same as V101	2-4
V103	20875-180	Tube - 6DJ8	2-4
V104	20877-22	Tube - Selected and paired 6DJ8	2-4
V105	20875-181	Tube - 6DK6	2-4
V106		Same as V105	2-4
V107		Same as V104	2-4
V108	20875-69	Tube - 12AU7	2-4
V109		Same as V105	2-4
V110		Same as V105	2-4
V111		Same as V105	2-4
V112		Same as V105	2-4
V113		Same as V105	2-4
V114		Same as V105	2-4
V115		Same as V105	2-4
V116		Same as V105	2-4
V117		Same as V105	2-4

p/o = part of

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
V118		Same as V105	2-4
V119		Same as V105	2-4
V120		Same as V105	2-4
V201	20875-206	Tube - 6DJ8	2-9
V203		Same as V201	
V251		Same as V103	2-9
V253		Same as V103	2-9
V254	20875-230	Tube - 6AU8A	2-9
V255		Same as V103	2-9
V256	20875-231	Tube - 6EJ7 Amperex	2-9
V257	20875-137	Tube - 6BA8A	2-9
V258		Same as V254	2-9
V260		Same as V254	2-9
V261	20875-229	Tube - 6CX8	2-9
V262		Same as V103	2-9
V263		Same as V103	2-9
V401		Same as V201	2-11
V402		Same as V201	2-11
V450		Same as V103	2-11
V451		Same as V103	2-11
V453		Same as V254	2-11
V454		Same as V103	2-11
V455	20875-75	Tube - 6AU6	2-11
V456	20875-171	Tube - 12AL5	2-11
V457	20875-70	Tube - 12AU6	2-11
V551		Same as V455	2-11
V552		Same as V455	2-11
V553		Same as V103	2-11
V554		Same as V103	2-11
V601	20875-172	Tube - 12B4	2-11
V602	20875-153	Tube - 6BH6	2-17

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
V603	20875-157	Tube - 6080/6AS7GA	2-17
V604		Same as V602	2-17
V605		Same as V603	2-17
V606		Same as V602	2-17
V607	20875-80	Tube - 12AX7	2-17
V608		Same as V602	2-17
V609	20875-228	Tube - 6DE7	2-17
V610		Same as V609	2-17
V611		Same as V609	2-17
V612		Same as V602	2-17
V613	20875-158	Tube - 5651	2-17
V614		Same as V607	2-17
V701	20875-168	Tube - 6AU5	2-20
V702		Same as V108	2-20
V703	20875-169	Tube - 5642	2-23
V704		Same as V703	2-23
V705		Same as V703	2-23
V706		Same as V703	2-23
V707		Same as V703	2-23
V709	20875-182	Tube - 5BHP2 cathode ray per AF Spec, PD-NE-6625-28	
		or	
	20875-234	Tube - 5BHP31 per AF Spec, PD-NE-6625-28	
V751		Same as V108	2-17
V752		Same as V455	2-17
V801		Same as V103	2-11
V852	20877-15	Tube - Selected and paired 6DJ8	2-27
V853	20875-105	Tube - 6CL6	2-9
V854		Same as V852	2-9
V855		Same as V261	2-9
VR250		Same as DS851	2-12
VR251		Same as DS851	2-6
VR252		Same as DS851	2-6

INDEX NO.	HICKOK PART NO.	NOMENCLATURE	FIGURE NO.
VR253		Same as DS851	2-6
VR351		Same as DS851	1-23
VR451		Same as DS851	2-15
VR452		Same as DS851	2-15
VR453		Same as DS851	2-15
VR551		Same as DS851	2-16
VR552		Same as DS851	2-16
VR851		Same as DS851	2-16
VR852		Same as DS851	2-27

T.O. 33A1-13-66-11

T.O. 33A1-13-66-11

INSTRUCTIONS AND PARTS LIST

RETURN TO B. L. KENNEY
RT-1, BOX 33A
RAINELLE, W.Va.
25962

for

HICKOK

OSCILLOSCOPE

MODEL 1805A

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Manufactured By

THE HICKOK ELECTRICAL INSTRUMENT COMPANY
10514 Dupont Avenue
Cleveland 8, Ohio

Printed in U. S. A.

2490-436

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PRELIMINARY DATA

PARTS BREAKDOWN
FOR
OSCILLOSCOPE
MODEL NO. 1805

THE HICKOK ELECTRICAL INSTRUMENT CO.
CLEVELAND, OHIO, U.S.A.

PART NUMBER 902-331

NOTE

This is preliminary data used for packaging with the equipment and is authorized for temporary use until official technical order handbooks become available.

2490-374

16 NOVEMBER 1959

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PRELIMINARY PARTS LIST

OSCILLOSCOPE, MODEL NO. 1805

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME	PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO. / FED. MFR. CODE	MANUFACTURERS PART NUMBER	USABLE ON CODE
1	1		OSCILLOSCOPE 28569	902-331	
2	2		ADAPTER, RF CON 28569	1050-101	2
3	2	H138	BRACKET, ANGLE 28569	2660-781	2
4	2	H140	BRACKET, ANGLE 28569	2660-785	1
5	2	H102 4730-	BUSHING, THD 28569	2900-55	1
6	2	6145-	CABLE ASSY, POW 28569	3030-120	1
7	3	6145-	CABLE ASSY 28569	3025-518	1
8	3	5935-	CONNECTOR, PLUG 81349	16525-118 UP-120M	1
9	2	C210 5910-538-7424	CAPACITOR 81349	X3110-64 CK63Y103Z	4
10	2	C425 5910-538-7424	CAPACITOR 81349	Same as 9 CK63Y103Z	Ref
11	2	C618 5910-538-7424	CAPACITOR 81349	Same as 9 CK63Y103Z	Ref
12	2	C706 5910-538-7424	CAPACITOR 81349	Same as 9 CK63Y103Z	Ref
13	2	C101 5910-275-6434	CAPACITOR 81349	X3110-65 CK62Y472Z	17
14	2	C102 5910-275-6434	CAPACITOR 81349	Same as 13 CK62Y472Z	Ref
15	2	C113 5910-275-6434	CAPACITOR 81349	Same as 13 CK62Y472Z	Ref
16	2	C117 5910-275-6434	CAPACITOR 81349	Same as 13 CK62Y472Z	Ref
17	2	C122 5910-275-6434	CAPACITOR 81349	Same as 13 CK62Y472Z	Ref
18	2	C126 5910-275-6434	CAPACITOR 81349	Same as 13 CK62Y472Z	Ref
19	2	C155 5910-275-6434	CAPACITOR 81349	Same as 13 CK62Y472Z	Ref
20	2	C208 5910-275-6434	CAPACITOR 81349	Same as 13 CK62Y472Z	Ref

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
21	2	C212 5910-275-6434	CAPACITOR	81349	Same as 13 CK62Y472Z	Ref
22	2	C216 5910-275-6434	CAPACITOR	81349	Same as 13 CK62Y472Z	Ref
23	2	C219 5910-275-6434	CAPACITOR	81349	Same as 13 CK62Y472Z	Ref
24	2	C221 5910-275-6434	CAPACITOR	81349	Same as 13 CK62Y472Z	Ref
25	2	C428 5910-275-6434	CAPACITOR	81349	Same as 13 CK62Y472Z	Ref
26	2	C609 5910-275-6434	CAPACITOR	81349	Same as 13 CK62Y472Z	Ref
27	2	C613 5910-275-6434	CAPACITOR	81349	Same as 13 CK62Y472Z	Ref
28	2	C622 5910-275-6434	CAPACITOR	81349	Same as 13 CK62Y472Z	Ref
29	2	C715 5910-275-6434	CAPACITOR	81349	Same as 13 CK62Y472Z	Ref
30	2	C201 5910-	CAPACITOR	72982	3110-87 N330A4.7 ± 1 uuf	3
31	2	C502 5910-	CAPACITOR	72982	Same as 30 N330A4.7 ± 1 uuf	Ref
32	2	C508 5910-	CAPACITOR	72982	Same as 30 N330A4.7 ± 1 uuf	Ref
33	2	C214 5910-552-1939	CAPACITOR	81349	X3110-88 CC20CH080D	1
34	2	C217 5910-171-3172	CAPACITOR	81349	X3110-90 CC20SL120K	4
35	2	C218 5910-171-3172	CAPACITOR	81349	Same as 34 CC20SL120K	Ref
36	2	C412 5910-171-3172	CAPACITOR	81349	Same as 34 CC20SL120K	Ref
37	2	C413 5910-171-3172	CAPACITOR	81349	Same as 34 CC20SL120K	Ref
38	2	C209 5910-	CAPACITOR	81349	X3110-91 CC20SL220M	5
39	2	C406 5910-	CAPACITOR	81349	Same as 38 CC20SL220M	Ref
40	2	C411 5910-	CAPACITOR	81349	Same as 38 CC20SL220M	Ref
41	2	C426 5910-	CAPACITOR	81349	Same as 38 CC20SL220M	Ref
42	2	C429 5910-	CAPACITOR	81349	Same as 38 CC20SL220M	Ref

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
43	2	C621 5910-	CAPACITOR	72982	3110-93 Z5U0203P	1
44	2	C215 5910-	CAPACITOR	81349	X3110-95 CC20SL270K	2
45	2	C753 5910-	CAPACITOR	81349	Same as 44 CC20SL270K	Ref
46	2	C240 5910-	CAPACITOR	81349	X3110-96 CC20SL390K	2
47	2	C414 5910-	CAPACITOR	81349	Same as 46 CC20SL390K	Ref
48	2	C205 5910-196-0159	CAPACITOR	81349	X3110-97 CC20SL470K	3
49	2	C407 5910-196-0159	CAPACITOR	81349	Same as 48 CC20SL470K	Ref
50	2	C427 5910-196-0159	CAPACITOR	81349	Same as 48 CC20SL470K	Ref
51	2	C203 5910-	CAPACITOR	72982	3110-99 U2M0101M	1
52	2	C118 5910-	CAPACITOR	72982	3110-100 GP2A150 ± 30 uuf	8
53	2	C127 5910-	CAPACITOR	72982	Same as 52 GP2A150 ± 30 uuf	Ref
54	2	C130 5910-	CAPACITOR	72982	Same as 52 GP2A150 ± 30 uuf	Ref
55	2	C133 5910-	CAPACITOR	72982	Same as 52 GP2A150 ± 30 uuf	Ref
56	2	C138 5910-	CAPACITOR	72982	Same as 52 GP2A150 ± 30 uuf	Ref
57	2	C141 5910-	CAPACITOR	72982	Same as 52 GP2A150 ± 30 uuf	Ref
58	2	C148 5910-	CAPACITOR	72982	Same as 52 GP2A150 ± 30 uuf	Ref
59	2	C150 5910-	CAPACITOR	72982	Same as 52 GP2A150 ± 30 uuf	Ref
60	2	C410 5910-	CAPACITOR	72982	3110-101 GP2A470 uuf ± 20%	1
61	2	C220 5910-	CAPACITOR	72982	3110-104 GP1A82 uuf ± 10%	2
62	2	C241 5910-	CAPACITOR	72982	Same as 61 GP1A82 uuf ± 10%	Ref
63	2	C1208 5910-539-7700	CAPACITOR	78488	3110-105 GA-2	1
64	2	C403 5910-	CAPACITOR	81349	X3110-106 CC33CG101K	1

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
65	2	C103 5910-	CAPACITOR	72982	3110-107 Z5U0102P	27
66	2	C116 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
67	2	C119 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
68	2	C120 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
69	2	C129 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
70	2	C131 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
71	2	C132 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
72	2	C135 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
73	2	C136 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
74	2	C139 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
75	2	C140 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
76	2	C143 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
77	2	C144 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
78	2	C152 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
79	2	C153 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
80	2	C154 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
81	2	C202 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
82	2	C204 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
83	2	C211 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
84	2	C213 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
85	2	C242 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	REF
86	2	C243 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
87	2	C405 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
88	2	C423 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
89	2	C754 5910-	CAPACITOR	72982	Same as 65 Z5U0102P	Ref
90	2	C1205 5910-666-7114	CAPACITOR	81349	X3110-111 CC20SK1R5C	16
91	2	C1206 5910-666-7114	CAPACITOR	81349	Same as 90 CC20SK1R5C	Ref
92	2	C1215 5910-666-7114	CAPACITOR	81349	Same as 90 CC20SK1R5C	Ref
93	2	C1216 5910-666-7114	CAPACITOR	81349	Same as 90 CC20SK1R5C	Ref
94	2	C1221 5910-666-7114	CAPACITOR	81349	Same as 90 CC20SK1R5C	Ref
95	2	C1222 5910-666-7114	CAPACITOR	81349	Same as 90 CC20SK1R5C	Ref
96	2	C1227 5910-666-7114	CAPACITOR	81349	Same as 90 CC20SK1R5C	Ref
97	2	C1228 5910-666-7114	CAPACITOR	81349	Same as 90 CC20SK1R5C	Ref
98	2	C1233 5910-666-7114	CAPACITOR	81349	Same as 90 CC20SK1R5C	Ref
99	2	C1234 5910-666-7114	CAPACITOR	81349	Same as 90 CC20SK1R5C	Ref
100	2	C1239 5910-666-7114	CAPACITOR	81349	Same as 90 CC20SK1R5C	Ref
101	2	C1240 5910-666-7114	CAPACITOR	81349	Same as 90 CC20SK1R5C	Ref
102	2	C1245 5910-666-7114	CAPACITOR	81349	Same as 90 CC20SK1R5C	Ref
103	2	C1246 5910-666-7114	CAPACITOR	81349	Same as 90 CC20SK1R5C	Ref
104	2	C1251 5910-666-7114	CAPACITOR	81349	Same as 90 CC20SK1R5C	Ref
105	2	C1252 5910-666-7114	CAPACITOR	81349	Same as 90 CC20SK1R5C	Ref
106	2	C111 5910-	CAPACITOR	72982	3110-112 X5U0102K	2
107	2	C112 5910-	CAPACITOR	72982	Same as 106 X5U0102K	Ref
108	2	C1202 5910-	CAPACITOR	78488	3110-113 GA-1	4

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
109	2	C1203 5910-	CAPACITOR	78488	Same as 108 GA-1	Ref
110	2	C1213 5910-	CAPACITOR	78488	Same as 108 GA-1	Ref
111	2	C1214 5910-	CAPACITOR	78488	Same as 108 GA-1	Ref
112	2	C601 5910-	CAPACITOR	80183	3085-88 TVL-2764HKT-7	1
113	2	C603 5910-	CAPACITOR	80183	3085-89 TVL-1638HKT-7	1
114	2	C614 5910-244-8066	CAPACITOR	81349	X3085-90 CE41C121P	1
115	2	C606 5910-552-9894	CAPACITOR	80183	3085-91 TVL-1760	1
116	2	C610 5910-	CAPACITOR	80183	3085-92 TVL-1540	2
117	2	C611 5910-	CAPACITOR	80183	Same as 116 TVL-1540	Ref
118	2	C504 5910-	CAPACITOR	14655	3085-93 BBR6.25-300-2	1
119	2	C605 5910-	CAPACITOR	80183	3085-95 TVL-3776	1
120	2	C704 5910-	CAPACITOR	80183	3085-96 TVL-2755	1
121	2	C619 5910-	CAPACITOR	80183	3085-97 TVL-2520HKT-7	1
122	2	C105 5910-	CAPACITOR	80183	3085-98 TVL-3842.6	1
123	2	C104 5910-	CAPACITOR	81349	3085-102 CE32F200R	1
124	2	C109 5910-	CAPACITOR	80183	3085-103 5Z934-913	1
125	2	C239 5910-	CAPACITOR	81349	3095-6 CM20C221K	2
126	2	C424 5910-	CAPACITOR	81349	Same as 125 CM20C221K	Ref
127	2	C421 5910-101-5639	CAPACITOR	81349	3095-49 CM20C390J	1
128	2	C751 5910-	CAPACITOR	81349	3095-55 CM20C331K	2
129	2	C752 5910-	CAPACITOR	81349	Same as 128 CM20C331K	Ref
130	2	C231 5910-101-5658	CAPACITOR	81349	3085-104 CM20C820J	2

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
131	2	C233 5910-101-5658	CAPACITOR	81349	Same as 130 CM20C820J	Ref
132	2	C229 5910-	CAPACITOR	76433	3095-108 MCM20D620F	1
133	2	C418 5910-	CAPACITOR	76433	3095-109 MCM20D431F	1
134	2	C228 5910-	CAPACITOR	76433	3095-110 MCM20D911F	1
135	2	C419 5910-	CAPACITOR	81349	3095-111 CM20C360J	1
136	2	C718 5910-280-9608	CAPACITOR	56289	3105-241 184P153030	3
137	2	C717 5910-280-9608	CAPACITOR	56289	Same as 136 184P153030	Ref
138	2	C722 5910-280-9608	CAPACITOR	56289	Same as 136 184P153030	Ref
139	2	C237 5910-	CAPACITOR	56289	3105-242 109P22304	1
140	2	C121 5910-	CAPACITOR	56289	3105-243 109P22306	1
141	2	C408 5910-	CAPACITOR	56289	3105-244 109P47304	3
142	2	C507 5910-	CAPACITOR	56289	Same as 141 109P47304	Ref
143	2	C701 5910-	CAPACITOR	56289	Same as 141 109P47304	Ref
144	2	C236 5910-	CAPACITOR	56289	3105-246 109P22404	1
145	2	C708 5910-	CAPACITOR	56289	3105-247 184P4710100	2
146	2	C709 5910-	CAPACITOR	56289	Same as 145 184P4710100	Ref
147	2	C202 5910-	CAPACITOR	56289	3105-248 109P10206	3
148	2	C702 5910-	CAPACITOR	56289	Same as 147 109P10206	Ref
149	2	C705 5910-	CAPACITOR	56289	Same as 147 109P10206	Ref
150	2	C409 5910-	CAPACITOR	56289	3105-249 109P47204	1
151	2	C707 5910-	CAPACITOR	56289	3105-250 184P682030	2
152	2	C711 5910-	CAPACITOR	56289	Same as 151 184P682030	Ref

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153	2	C710 5910-	CAPACITOR	56289	3105-251 184P682050	3
154	2	C720 5910-	CAPACITOR	56289	Same as 153 184P682050	Ref
155	2	C721 5910-	CAPACITOR	56289	Same as 153 184P682050	Ref
156	2	C503 5910-	CAPACITOR	56289	3105-252 109P10304	11
157	2	C602 5910-	CAPACITOR	56289	Same as 156 109P10304	Ref
158	2	C604 5910-	CAPACITOR	56289	Same as 156 109P10304	Ref
159	2	C607 5910-	CAPACITOR	56289	Same as 156 109P10304	Ref
160	2	C608 5910-	CAPACITOR	56289	Same as 156 109P10304	Ref
161	2	C612 5910-	CAPACITOR	56289	Same as 156 109P10304	Ref
162	2	C615 5910-	CAPACITOR	56289	Same as 156 109P10304	Ref
163	2	C616 5910-	CAPACITOR	56289	Same as 156 109P10304	Ref
164	2	C617 5910-	CAPACITOR	56289	Same as 156 109P10304	Ref
165	2	C620 5910-	CAPACITOR	56289	Same as 156 109P10304	Ref
166	2	C703 5910-	CAPACITOR	56289	Same as 156 109P10304	Ref
167	2	C238 5910-	CAPACITOR	56289	3105-253 109P22204	1
168	2	C106 5910-	CAPACITOR	56289	3105-266 109P10404	1
169	2	C206 5910-539-7706	CAPACITOR	56289	3105-269 109P10402	1
170	2	C222 5910-	CAPACITOR	56289	3105-270 109P47392	1
171	2	C417 5910-	CAPACITOR	28569	3105-254	1
172	2	C225 5910-	CAPACITOR	28569	3105-255	1
173	2	C402 5910-	CAPACITOR	72982	3115-13 557-06NP05-25 uuf	2
174	2	C404 5910-	CAPACITOR	72982	Same as 173 557-06NP05-25 uuf	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
175	2	C506 5910-	CAPACITOR	72982	3115-14 557-06NP03-12 uuf	42
176	2	C511 5910-	CAPACITOR	72982	Same as 175 557-06NP03-12 uuf	Ref
177	2	C509 5910-	CAPACITOR	72982	3115-16 503-27NP01.5-7 uuf	1
178	2	C232 5910-	CAPACITOR	72982	3115-20 503-27NP04.5-25 uuf	2
179	2	C234 5910-	CAPACITOR	72982	Same as 178 503-27NP04.5-25 uuf	Ref
180	2	C230 5910-	CAPACITOR	72982	3115-21 503-27N500 7-45 uuf	2
181	2	C420 5910-	CAPACITOR	72982	Same as 180 503-27N500 7-45 uuf	Ref
182	2	C401 5910-	CAPACITOR	72982	3115-22 557-06N750 8-50 uuf	1
183	2	C235 5910-	CAPACITOR	72982	3115-23 503-27NP03-12 uuf	2
184	2	C422 5910-	CAPACITOR	72982	Same as 183 503-27NP03-12 uuf	Ref
185	2	C125 5910-	CAPACITOR	72982	3115-25 535-17	57
186	2	C128 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
187	2	C134 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
188	2	C137 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
189	2	C142 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
190	2	C149 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
191	2	C151 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
192	2	C1201 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
193	2	C1204 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
194	2	C1207 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
195	2	C1209 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
196	2	C1210 5910-	CAPACITOR	72982	Same as 185 535-17	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
197	2	C1211 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
198	2	C1217 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
199	2	C1218 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
200	2	C1219 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
201	2	C1220 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
202	2	C1223 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
203	2	C1224 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
204	2	C1225 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
205	2	C1226 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
206	2	C1229 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
207	2	C1230 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
208	2	C1231 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
209	2	C1232 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
210	2	C1235 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
211	2	C1236 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
212	2	C1237 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
213	2	C1238 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
214	2	C1241 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
215	2	C1242 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
216	2	C1243 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
217	2	C1244 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
218	2	C1247 5910-	CAPACITOR	72982	Same as 185 535-17	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	USABLE ON CODE
219	2	C1248 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
220	2	C1249 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
221	2	C1250 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
222	2	C1255 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
223	2	C1256 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
224	2	C1257 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
225	2	C1258 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
226	2	C1259 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
227	2	C1260 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
228	2	C1261 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
229	2	C1262 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
230	2	C1263 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
231	2	C1264 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
232	2	C1265 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
233	2	C1266 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
234	2	C1267 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
235	2	C1268 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
236	2	C1269 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
237	2	C1270 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
238	2	C1271 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
239	2	C1272 5910-	CAPACITOR	72982	Same as 185 535-17	Ref
240	2	C1273 5910-	CAPACITOR	72982	Same as 185 535-17	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO. / FED. MFR. CODE	MANUFACTURERS PART NUMBER	USABLE ON CODE
241	2	C1274 5910-	CAPACITOR 72982	Same as 185 535-17	Ref
242	2	C123 5910-	CAPACITOR 72982	3115-26 U2P034R	2
243	2	C124 5910-	CAPACITOR 72982	Same as 242 U2P034R	Ref
244	2	6625-	CLIP ASSEMBLY 28569	3300-84	2
245	3	6625-	CLIP, ELECT'CAL 83330	1152AX	2
246	3	5970-	INSULATOR 28569	9720-45	2
247	3	5935-	PLUG, TIP 28569	16525-171	2
248	2	6625-	CLIP ASSEMBLY 28569	Same as 244 3300-84	Ref
249	3	6625-	CLIP, ELECT'CAL 83330	Same as 245 1152AX	Ref
250	3	5970-	INSULATOR 28569	Same as 246 9720-45	Ref
251	3	5935-	PLUG, TIP 28569	Same as 247 16525-171	Ref
252	2	L201 5950-	COIL, RF 28569	3320-145	1
253	2	L202 5950-	COIL, RF 28569	3320-148	1
254	2	L101 5950-	COIL, RF 28569	3320-160	2
255	2	L102 5950-	COIL, RF 28569	Same as 254 3320-160	Ref
256	2	L103 5950-	COIL, RF 28569	3320-161	2
257	2	L104 5950-	COIL, RF 28569	Same as 256 3320-161	Ref
258	2	L106 5950-	COIL, RF 28569	3320-162	2
259	2	L107 5950-	COIL, RF 28569	Same as 258 3320-162	Ref
260	2	L105 5950-	COIL, RF 28569	3320-167	1
261	2	L1205 5950-	COIL, RF 28569	3320-169	2
262	2	L1206 5950-	COIL, RF 28569	Same as 261 3320-169	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO. / FED. MFR. CODE	MANUFACTURERS PART NUMBER	USABLE ON CODE
263	2	L109 5950-	COIL ASS'Y, RF 28569	3320-163	2
264	2	L110 5950-	COIL ASS'Y, RF 28569	Same as 263 3320-163	Ref
265	2	L108 5950-	COIL ASS'Y, RF 28569	3320-164	2
266	2	L111 5950-	COIL ASS'Y, RF 28569	Same as 265 3320-164	Ref
267	2	L1201 5950-	COIL ASS'Y, RF 28569	3320-165	2
268	2	L1202 5950-	COIL ASS'Y, RF 28569	Same as 267 3320-165	Ref
269	2	L1203 5950-	COIL ASS'Y, RF 28569	3320-166	2
270	2	L1204 5950-	COIL ASS'Y, RF 28569	Same as 269 3320-166	Ref
271	2	J201 5935-	CONNECTOR 28569	3475-83	2
272	2	J751 5935-	CONNECTOR 28569	Same as 271 3475-83	Ref
273	2	J401 5935-	CONNECTOR 28569	3475-85	1
274	2	J601 5935-	CONNECTOR 89473	16525-164 4343-5	1
275	2	J103 5935-283-2908	CONNECTOR 02660	18075-60 26-190-16	1
276	2	H119 5355-616-9914	DIAL, CONTROL 73138	11505-84 RB	1
27	2	V208 5960-	ELECTRON TUBE 79089	20875-51 6AL5	1
278	2	V108 5960-166-7663	ELECTRON TUBE 81349	X20875-69 12AU7	3
279	2	V401 5960-166-7663	ELECTRON TUBE 81349	Same as 278 12AU7	Ref
280	2	V702 5960-166-7663	ELECTRON TUBE 81349	Same as 278 12AU7	Ref
281	2	V409 5960-262-0296	ELECTRON TUBE 82219	20875-70 12AU6	1
282	2	V209 5960-262-0152	ELECTRON TUBE 81349	X20875-75 6AU6	8
283	2	V411 5960-262-0152	ELECTRON TUBE 81349	Same as 282 6AU6	Ref
284	2	V412 5960-262-0152	ELECTRON TUBE 81349	Same as 282 6AU6	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
285	2	V602 5960-262-0152	ELECTRON TUBE	81349	Same as 282 6AU6	Ref
286	2	V604 5960-262-0152	ELECTRON TUBE	81349	Same as 282 6AU6	Ref
287	2	V606 5960-262-0152	ELECTRON TUBE	81349	Same as 282 6AU6	Ref
288	2	V608 5960-262-0152	ELECTRON TUBE	81349	Same as 282 6AU6	Ref
289	2	V612 5960-262-0152	ELECTRON TUBE	81349	Same as 282 6AU6	Ref
290	2	V607 5960-166-7664	ELECTRON TUBE	81349	X20875-80 12AX7	2
291	2	V614 5960-166-7664	ELECTRON TUBE	81349	Same as 290 12AX7	Ref
292	2	V212 5960-295-8464	ELECTRON TUBE	81349	X20875-105 6CL6	2
293	2	V504 5960-295-8464	ELECTRON TUBE	81349	Same as 292 6CL6	Ref
294	2	V202 5960-543-0966	ELECTRON TUBE	82219	20875-118 6U8	8
295	2	V203 5960-543-0966	ELECTRON TUBE	82219	Same as 294 6U8	Ref
296	2	V204 5960-543-0966	ELECTRON TUBE	82219	Same as 294 6U8	Ref
297	2	V403 5960-543-0966	ELECTRON TUBE	82219	Same as 294 6U8	Ref
298	2	V406 5960-543-0966	ELECTRON TUBE	82219	Same as 294 6U8	Ref
299	2	V413 5960-543-0966	ELECTRON TUBE	82219	Same as 294 6U8	Ref
300	2	V414 5960-543-0966	ELECTRON TUBE	82219	Same as 294 6U8	Ref
301	2	V751 5960-543-0966	ELECTRON TUBE	82219	Same as 294 6U8	Ref
302	2	V206 5960-538-2363	ELECTRON TUBE	81349	X20875-130 12BY7A	1
303	2	V501 5960-	ELECTRON TUBE	81349	X20875-137 6BA8	1
304	2	V603 5960-	ELECTRON TUBE	81349	X20875-157 6080/6AS7GA	2
305	2	V605 5960-	ELECTRON TUBE	81349	Same as 304 6080/6AS7GA	Ref
306	2	V613 5960-	ELECTRON TUBE	79089	20875-158 5651	1

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307	2	V701 5960-	ELECTRON TUBE	79089	20875-168 6AU5	1
308	2	V703 5960-230-5231	ELECTRON TUBE	79089	20875-169 5642	5
309	2	V704 5960-230-5231	ELECTRON TUBE	79089	Same as 308 5642	Ref
310	2	V705 5960-230-5231	ELECTRON TUBE	79089	Same as 308 5642	Ref
311	2	V706 5960-230-5231	ELECTRON TUBE	79089	Same as 308 5642	Ref
312	2	V707 5960-230-5231	ELECTRON TUBE	79089	Same as 308 5642	Ref
313	2	V408 5960-188-0969	ELECTRON TUBE	79089	20875-171 12AL5	1
314	2	V601 5960-636-0106	ELECTRON TUBE	24454	20875-172 12B4	4
315	2	V609 5960-636-0106	ELECTRON TUBE	24454	Same as 314 12B4	Ref
316	2	V610 5960-636-0106	ELECTRON TUBE	24454	Same as 314 12B4	Ref
317	2	V611 5960-636-0106	ELECTRON TUBE	24454	Same as 314 12B4	Ref
318	2	V107 5960-	ELECTRON TUBE	73445	20875-180 6DJ8	13
319	2	V201 5960-	ELECTRON TUBE	73445	Same as 318 6DJ8	Ref
320	2	V205 5960-	ELECTRON TUBE	73445	Same as 318 6DJ8	Ref
321	2	V207 5960-	ELECTRON TUBE	73445	Same as 318 6DJ8	Ref
322	2	V210 5960-	ELECTRON TUBE	73445	Same as 318 6DJ8	Ref
323	2	V211 5960-	ELECTRON TUBE	73445	Same as 318 6DJ8	Ref
324	2	V402 5960-	ELECTRON TUBE	73445	Same as 318 6DJ8	Ref
325	2	V404 5960-	ELECTRON TUBE	73445	Same as 318 6DJ8	Ref
326	2	V405 5960-	ELECTRON TUBE	73445	Same as 318 6DJ8	Ref
327	2	V407 5960-	ELECTRON TUBE	73445	Same as 318 6DJ8	Ref
328	2	V502 5960-	ELECTRON TUBE	73445	Same as 318 6DJ8	Ref

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329	2	V708 5960-	ELECTRON TUBE	73445	Same as 318 6DJ8	Ref
330	2	V710 5960-	ELECTRON TUBE	73445	Same as 318 6DJ8	Ref
331	2	V105 5960-	ELECTRON TUBE	92237	20875-181 6DK6	14
332	2	V106 5960-	ELECTRON TUBE	92237	Same as 331 6DK6	Ref
333	2	V109 5960-	ELECTRON TUBE	92237	Same as 331 6DK6	Ref
334	2	V110 5960-	ELECTRON TUBE	92237	Same as 331 6DK6	Ref
335	2	V111 5960-	ELECTRON TUBE	92237	Same as 331 6DK6	Ref
336	2	V112 5960-	ELECTRON TUBE	92237	Same as 331 6DK6	Ref
337	2	V113 5960-	ELECTRON TUBE	92237	Same as 331 6DK6	Ref
338	2	V114 5960-	ELECTRON TUBE	92237	Same as 331 6DK6	Ref
339	2	V115 5960-	ELECTRON TUBE	92237	Same as 331 6DK6	Ref
340	2	V116 5960-	ELECTRON TUBE	92237	Same as 331 6DK6	Ref
341	2	V117 5960-	ELECTRON TUBE	92237	Same as 331 6DK6	Ref
342	2	V118 5960-	ELECTRON TUBE	92237	Same as 331 6DK6	Ref
343	2	V119 5960-	ELECTRON TUBE	92237	Same as 331 6DK6	Ref
344	2	V120 5960-	ELECTRON TUBE	92237	Same as 331 6DK6	Ref
345	2	V709 5960-581-8738	ELECTRON TUBE	20183	20875-182 5BHP2	1
346	2	V101 5960-	ELEC TBS, MTCHD	28569	X20877-10	1 pr.
347	2	V102 5960-	ELEC TBS, MTCHD	28569	Same as 346 X20877-10	Ref
348	2	V103 5960-	ELEC TBS, MTCHD	28569	20877-15	2 pr.
349	2	V104 5960-	ELEC TBS, MTCHD	28569	Same as 348 20877-15	Ref
350	2	V503 5960-	ELEC TBS, MTCHD	28569	Same as 348 20877-15	Ref

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351	2	V505 5960-	ELEC TBS, MTCHD	28569	Same as 348 20877-15	Ref
352	2	6625-	FILTER, LT, CRT	28569	6265-8	1
353	2	H109 4130-	FILTER, AIR CON	28569	6265-11	1
354	2	F101 5920-281-0225	FUSE, CARTRIDGE	81349	6900-28 F02G6R00A	1
355	2	XF101 5920-296-3287	FUSEHOLDER	71400	8825-14 HKP	1
356	3	5920-	CAP, ELECTRICAL	71400	8825-93 HKP-CAP ONLY	1
357	3	5920-	FUSEHOLDER	71400	8825-102 HKP-BODY ONLY	1
358	2	H101 4450-	IMPELLER, FAN	60380	2380-2 0UH-731-5	1
359	2	H114 5340-	INSERT, SCR THD	28569	2900-54	3
360	2	E117	INSULATOR, CON	28569	9700-21	1
361	2	J752 5935-257-7413	JACK, TIP	72825	10300-2 7886BLACK	1
362	2	H148 5355-	KNOB	28569	11505-85	3
363	2	H151 5355	KNOB	28569	11505-87	4
364	2	H155 5355-	KNOB	28569	11505-90	5
365	2	H160 5355-	KNOB	28569	11505-91	1
366	2	H161 5355-	KNOB	28569	11505-92	3
367	2	H164 5355-	KNOB	28569	11505-94	5
368	2	DS101 6240-	LAMP, GLOW	24455	12270-26 NE-2	8
369	2	DS103 6240-	LAMP, GLOW	24455	Same as 368 NE-2	Ref
370	2	DS201 6240-	LAMP, GLOW	24455	Same as 368 NE-2	Ref
371	2	VR201 6240-	LAMP, GLOW	24455	Same as 368 NE-2	Ref
372	2	VR202 6240-	LAMP, GLOW	24455	Same as 368 NE-2	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
373	2	VR401 6240-	LAMP, GLOW	24455	Same as 368 NE-2	Ref
374	2	VR402 6240-	LAMP, GLOW	24455	Same as 368 NE-2	Ref
375	2	VR501 6240-	LAMP, GLOW	24455	Same as 368 NE-2	Ref
376	2	DS501 6240-	LAMP, GLOW	28569	12270-42	2
377	2	DS502 6240-	LAMP, GLOW	28569	Same as 375 12270-42	Ref
378	2	DS601 6240-	LAMP, INCANDES	24455	12270-12 47	3
379	2	DS602 6240-	LAMP, INCANDES	24455	Same as 378 47	Ref
380	2	DS603 6240-	LAMP, INCANDES	24455	Same as 378 47	Ref
381	2	XDS602 6240-643-0480	LAMPHOLDER	96312	19350-203 706	2
382	2	XDS603 6240-643-0480	LAMPHOLDER	96312	Same as 381 706	Ref
383	2	6625-	LEAD, ELECT	05276	3675-31 B-18	1
384	2	6625-	LEAD, ELECT	28569	12450-326	2
385	2	6625-	LEAD, ELECT	28569	Same as 384 12450-326	Ref
386	2	6625-	LEAD, TEST	28569	16970-41	2
387	3	5935	ADAPTER	81349	1050-100 UG-176/U	2
388	3	6625-	CABLE ASS'Y, RF	28569	3025-532	2
389	3	C1 5910-	CAPACITOR	72982	Same as 175 557-06NP03-12 uuf	Ref
390	3	L11 5950-	COIL, RF	28569	3320-168	2
391	3	5935-	CONNECTOR, PLUG	28569	16525-167	2
392	3	R1 5905-	RESISTOR, FILM	19701	18531-9 DC1-9 MEGOHMS	2
393	2	6625-	LEAD, TEST	28569	Same as 386 16970-41	Ref
394	3	5935-	ADAPTER	81349	Same as 387 UG-176/U	Ref

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
395	3	6625-	CABLE ASS'Y, RF	28569	Same as 388 3025-532	Ref
396	3	C1 5910-	CAPACITOR	72982	Same as 389 557-06NP03-12 uuf	Ref
397	3	L11 5950-	COIL, RF	28569	Same as 390 3320-168	Ref
398	3	5935-	CONNECTOR, PLUG	28569	Same as 391 16525-167	Ref
399	3	R1 5905-	RESISTOR, FILM	19701	Same as 392 DC1-9 MEGOHMS	Ref
400	2	XDS601 6210-	LIGHT, IND'TOR	81349	19350-296 LH50BR2	1
401	2	MP701 5940-	LINK, TERM CON	28569	2145-7	1
402	2	B601 6105-	MOTOR, AC	83821	13750-4 103-1893	1
403	2	H120 5340-	MOUNT, RESIL'NT	28569	19200-13	3
404	2	H180 5310-	NUT, PLAIN HEX	28569	2900-48	1
405	2	H126 5315-	PIN, LOCK	28569	19450-88	2
406	2	E107 5940-	POST, BINDING	28569	2360-67	7
407	2	E203 5940-	POST, BINDING	28569	Same as 406 2360-67	Ref
408	2	E204 5940-	POST, BINDING	28569	Same as 406 2360-67	Ref
409	2	E402 5940-	POST, BINDING	28569	Same as 406 2360-67	Ref
410	2	E403 5940-	POST, BINDING	28569	Same as 406 2360-67	Ref
411	2	E601 5940-	POST, BINDING	28569	Same as 406 2360-67	Ref
412	2	E701 5940-	POST, BINDING	28569	Same as 406 2360-67	Ref
413	2	E702 5940-	POST, BINDING	58474	2360-80 BB10035-G1	1
414	2	E108 5940-	POST, BINDING	28569	2360-85	2
415	2	E202 5940-	POST, BINDING	28569	Same as 414 2360-85	Ref
416	2	CR605 6130-	RECTIFIER	77638	18150-48 22Q4484	1

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417	2	CR604 6130-	RECTIFIER	77638	18150-49 20S4485	1
418	2	CR603 6130-	RECTIFIER	77638	18150-50 16S4483	1
419	2	CR601 6130-	RECTIFIER	77638	18150-51 20M4482	1
420	2	CR602 6130-	RECTIFIER	77638	18150-52 16Q4481	1
421	2	K601 5945-	RELAY, SOLENOID	71482	18400-8 A100279	1
422	2	S603 5945-	RELAY, THERMAL	70563	20875-173 6N045T	1
423	2	R601 5905-	RESISTOR, COMP	81349	X18410-102 RC20GF100K	2
424	2	R668 5905-	RESISTOR, COMP	81349	Same as 423 RC20GF100K	Ref
425	2	R103 5905-	RESISTOR, COMP	81349	X18410-272 RC20GF270K	2
426	2	R111 5905-	RESISTOR, COMP	81349	Same as 425 RC20GF270K	Ref
427	2	R127 5905-	RESISTOR, COMP	81349	X18410-332 RC20GF330K	2
428	2	R128 5905-	RESISTOR, COMP	81349	Same as 427 RC20GF330K	Ref
429	2	R115 5905-	RESISTOR, COMP	81349	X18410-472 RC20GF470K	18
430	2	R116 5905-	RESISTOR, COMP	81349	Same as 429 RC20GF470K	Ref
431	2	R210 5905-	RESISTOR, COMP	81349	Same as 429 RC20GF470K	Ref
432	2	R211 5905-	RESISTOR, COMP	81349	Same as 429 RC20GF470K	Ref
433	2	R225 5905-	RESISTOR, COMP	81349	Same as 429 RC20GF470K	Ref
434	2	R230 5905-	RESISTOR, COMP	81349	Same as 429 RC20GF470K	Ref
435	2	R255 5905-	RESISTOR, COMP	81349	Same as 429 RC20GF470K	Ref
436	2	R257 5905-	RESISTOR, COMP	81349	Same as 429 RC20GF470K	Ref
437	2	R269 5905-	RESISTOR, COMP	81349	Same as 429 RC20GF470K	Ref
438	2	R297 5905-	RESISTOR, COMP	81349	Same as 429 RC20GF470K	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
439	2	R298 5905-	RESISTOR, COMP	81349	Same as 429 RC20GF470K	Ref
440	2	R496 5905-	RESISTOR, COMP	81349	Same as 429 RC20GF470K	Ref
441	2	R521 5905-	RESISTOR, COMP	81349	Same as 429 RC20GF470K	Ref
442	2	R525 5905-	RESISTOR, COMP	81349	Same as 429 RC20GF470K	Ref
443	2	R526 5905-	RESISTOR, COMP	81349	Same as 429 RC20GF470K	Ref
444	2	R720 5905-	RESISTOR, COMP	81349	Same as 429 RC20GF470K	Ref
445	2	R737 5905-	RESISTOR, COMP	81349	Same as 429 RC20GF470K	Ref
446	2	R742 5905-	RESISTOR, COMP	81349	Same as 429 RC20GF470K	Ref
447	2	R134 5905-	RESISTOR, COMP	81349	X18411-102 RC20GF101K	31
448	2	R142 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
449	2	R237 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
450	2	R247 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
451	2	R250 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
452	2	R264 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
453	2	R268 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
454	2	R305 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
455	2	R416 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
456	2	R417 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
457	2	R422 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
458	2	R430 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
459	2	R431 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
460	2	R439 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
461	2	R440 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
462	2	R443 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
463	2	R450 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
464	2	R452 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
465	2	R472 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
466	2	R479 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
467	2	R486 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
468	2	R489 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
469	2	R494 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
470	2	R503 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
471	2	R509 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
472	2	R515 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
473	2	R527 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
474	2	R534 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
475	2	R721 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
476	2	R761 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
477	2	R773 5905-	RESISTOR, COMP	81349	Same as 447 RC20GF101K	Ref
478	2	R263 5905-	RESISTOR, COMP	81349	X18411-272 RC20GF271K	1
479	2	R106 5905-	RESISTOR, COMP	81349	X18411-332 RC20GF331K	2
480	2	R109 5905-	RESISTOR, COMP	81349	Same as 479 RC20GF331K	Ref
481	2	R172 5905-279-1889	RESISTOR, COMP	81349	X18411-361 RC20GF361J	2
482	2	R173 5905-279-1889	RESISTOR, COMP	81349	Same as 481 RC20GF361J	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
483	2	R524 5905-	RESISTOR, COMP	81349	X18411-392 RC20GF391K	1
484	2	R299 5905-	RESISTOR, COMP	81349	X18411-472 RC20GF421K	1
485	2	R514 5905-195-6800	RESISTOR, COMP	81349	X18411-561 RC20GF561J	1
486	2	R229 5905-	RESISTOR, COMP	81349	X18411-822 RC20GF821K	1
487	2	R221 5905-	RESISTOR, COMP	81349	X18412-102 RC20GF102K	22
488	2	R261 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
489	2	R276 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
490	2	R436 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
491	2	R497 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
492	2	R616 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
493	2	R653 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
494	2	R654 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
495	2	R664 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
496	2	R701 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
497	2	R704 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
498	2	R718 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
499	2	R752 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
500	2	R755 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
501	2	R1201 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
502	2	R1202 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
503	2	R1203 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
504	2	R1204 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
505	2	R1205 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
506	2	R1206 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
507	2	R1207 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
508	2	R1208 5905-	RESISTOR, COMP	81349	Same as 487 RC20GF102K	Ref
509	2	R423 5905-	RESISTOR, COMP	81349	X18412-222 RC20GF222K	4
510	2	R445 5905-	RESISTOR, COMP	81349	Same as 509 RC20GF222K	Ref
511	2	R505 5905-	RESISTOR, COMP	81349	Same as 509 RC20GF222K	Ref
512	2	R523 5905-	RESISTOR, COMP	81349	Same as 509 RC20GF222K	Ref
513	2	R223 5905-	RESISTOR, COMP	81349	X18412-272 RC20GF272K	2
514	2	R447 5905-	RESISTOR, COMP	81349	Same as 513 RC20GF272K	Ref
515	2	R418 5905-	RESISTOR, COMP	81349	X18412-332 RC20GF332K	1
516	2	R487 5905-	RESISTOR, COMP	81349	X18412-392 RC20GF392K	1
517	2	R492 5905-	RESISTOR, COMP	81349	X18412-562 RC20GF562K	1
518	2	R744 5905-279-3503	RESISTOR, COMP	81349	X18412-681 RC20GF682J	1
519	2	R471 5905-	RESISTOR, COMP	81349	X18412-682 RC20GF682K	1
520	2	R739 5905-249-4195	RESISTOR, COMP	81349	X18412-751 RC20GF752J	1
521	2	R240 5905-	RESISTOR, COMP	81349	X18413-102 RC20GF103K	6
522	2	R273 5905-	RESISTOR, COMP	81349	Same as 521 RC20GF103K	Ref
523	2	R451 5905-	RESISTOR, COMP	81349	Same as 521 RC20GF103K	Ref
524	2	R477 5905-	RESISTOR, COMP	81349	Same as 521 RC20GF103K	Ref
525	2	R493 5905-	RESISTOR, COMP	81349	Same as 521 RC20GF103K	Ref
526	2	R727 5905-	RESISTOR, COMP	81349	Same as 521 RC20GF103K	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
527	2	R478 5905-	RESISTOR, COMP	81349	X18413-152 RC20GF153K	1
528	2	R215 5905-	RESISTOR, COMP	81349	X18413-222 RC20GF223K	3
529	2	R406 5905-	RESISTOR, COMP	81349	Same as 528 RC20GF223K	Ref
530	2	R498 5905-	RESISTOR, COMP	81349	Same as 528 RC20GF223K	Ref
531	2	R428 5905-	RESISTOR, COMP	81349	X18413-272 RC20GF273K	4
532	2	R603 5905-	RESISTOR, COMP	81349	Same as 531 RC20GF273K	Ref
533	2	R648 5905-	RESISTOR, COMP	81349	Same as 531 RC20GF273K	Ref
534	2	R728 5905-	RESISTOR, COMP	81349	Same as 531 RC20GF273K	Ref
535	2	R660 5905-	RESISTOR, COMP	81349	X18413-332 RC20GF333K	1
536	2	R271 5905-249-4256	RESISTOR, COMP	81349	X18413-361 RC20GF363J	1
537	2	R638 5905-	RESISTOR, COMP	81349	X18413-392 RC20GF393K	1
538	2	R120 5905-	RESISTOR, COMP	81349	X18413-472 RC20GF473K	14
539	2	R125 5905-	RESISTOR, COMP	81349	Same as 538 RC20GF473K	Ref
540	2	R222 5905-	RESISTOR, COMP	81349	Same as 538 RC20GF473K	Ref
541	2	R224 5905-	RESISTOR, COMP	81349	Same as 538 RC20GF473K	Ref
542	2	R262 5905-	RESISTOR, COMP	81349	Same as 538 RC20GF473K	Ref
543	2	R266 5905-	RESISTOR, COMP	81349	Same as 538 RC20GF473K	Ref
544	2	R296 5905-	RESISTOR, COMP	81349	Same as 538 RC20GF473K	Ref
545	2	R429 5905-	RESISTOR, COMP	81349	Same as 538 RC20GF473K	Ref
546	2	R446 5905-	RESISTOR, COMP	81349	Same as 538 RC20GR473K	Ref
547	2	R448 5905-	RESISTOR, COMP	81349	Same as 538 RC20GF473K	Ref
548	2	R457 5905-	RESISTOR, COMP	81349	Same as 538 RC20GF473K	Ref

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549	2	R476 5905-	RESISTOR, COMP	81349	Same as 538 RC20GF473K	Ref
550	2	R613 5905-	RESISTOR, COMP	81349	Same as 538 RC20GF473K	Ref
551	2	R637 5905-	RESISTOR, COMP	81349	Same as 538 RC20GF473K	Ref
552	2	R218 5905-	RESISTOR, COMP	81349	X18413-562 RC20GF563K	2
553	2	R624 5905-	RESISTOR, COMP	81349	Same as 552 RC20GF563K	Ref
554	2	R649 5905-	RESISTOR, COMP	81349	X18413-682 RC20GF683K	2
555	2	R756 5905-	RESISTOR, COMP	81349	Same as 554 RC20GF683K	Ref
556	2	R245 5905-195-6761	RESISTOR, COMP	81349	X18414-101 RC20GF104J	1
557	2	R203 5905-	RESISTOR, COMP	81349	X18414-102 RC20GF104K	20
558	2	R206 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref
559	2	R231 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref
560	2	R232 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref
561	2	R267 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref
562	2	R300 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref
563	2	R408 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref
564	2	R420 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref
565	2	R427 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref
566	2	R449 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref
567	2	R467 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref
568	2	R475 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref
569	2	R645 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref
570	2	R661 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref

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571	2	R663 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref
572	2	R665 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref
573	2	R703 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref
574	2	R732 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref
575	2	R752 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref
576	2	R759 5905-	RESISTOR, COMP	81349	Same as 557 RC20GF104K	Ref
577	2	R602 5905-	RESISTOR, COMP	81349	X18414-122 RC20GF124K	1
578	2	R137 5905-	RESISTOR, COMP	81349	X18414-152 RC20GF154K	5
579	2	R604 5905-	RESISTOR, COMP	81349	Same as 578 RC20GF154K	Ref
580	2	R635 5905-	RESISTOR, COMP	81349	Same as 578 RC20GF154K	Ref
581	2	R650 5905-	RESISTOR, COMP	81349	Same as 578 RC20GF154K	Ref
582	2	R751 5905-	RESISTOR, COMP	81349	Same as 578 RC20GF154K	Ref
583	2	R629 5905-	RESISTOR, COMP	81349	X18414-182 RC20GF184K	1
584	2	R246 5905-171-2003	RESISTOR, COMP	81349	X18414-201 RC20GF204J	1
585	2	R238 5905-	RESISTOR, COMP	81349	X18414-222 RC20GF224K	1
586	2	R421 5905-	RESISTOR, COMP	81349	X18414-272 RC20GF274K	3
587	2	R495 5905-	RESISTOR, COMP	81349	Same as 585 RC20GF274K	Ref
588	2	R623 5905-	RESISTOR, COMP	81349	Same as 585 RC20GF274K	Ref
589	2	R138 5905-	RESISTOR, COMP	81349	X18414-332 RC20GF334K	1
590	2	R202 5905-192-0377	RESISTOR, COMP	81349	X18414-391 RC20GF394J	1
591	2	R139 5905-	RESISTOR, COMP	81349	X18414-392 RC20GF394K	2
592	2	R141 5905-	RESISTOR, COMP	81349	Same as 591 RC20GF394K	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
593	2	R244 5905-279-2515	RESISTOR, COMP	81349	X18414-471 RC20GF474J	1
594	2	R107 5905-	RESISTOR, COMP	81349	X18414-472 RC20GF474K	28
595	2	R110 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
596	2	R129 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
597	2	R132 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
598	2	R154 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
599	2	R156 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
600	2	R157 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
601	2	R159 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
602	2	R160 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
603	2	R162 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
604	2	R163 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
605	2	R165 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
606	2	R166 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
607	2	R168 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
608	2	R169 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
609	2	R171 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
610	2	R207 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
611	2	R216 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
612	2	R217 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
613	2	R239 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref
614	2	R244 5905-	RESISTOR, COMP	81349	Same as 594 RC20GF474K	Ref

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615	2	R303 5905-	RESISTOR,	COMP 81349	Same as 594 RC20GF474K	Ref
616	2	R474 5905-	RESISTOR,	COMP 81349	Same as 594 RC20GF474K	Ref
617	2	R507 5905-	RESISTOR,	COMP 81349	Same as 594 RC20GF474K	Ref
618	2	R540 5905-	RESISTOR,	COMP 81349	Same as 594 RC20GF474K	Ref
619	2	R645 5905-	RESISTOR,	COMP 81349	Same as 594 RC20GF474K	Ref
620	2	R662 5905-	RESISTOR,	COMP 81349	Same as 594 RC20GF474K	Ref
621	2	R704 5905-	RESISTOR,	COMP 81349	Same as 594 RC20GF474K	Ref
622	2	R510 5905-	RESISTOR,	COMP 81349	X18414-562 RC20GF564K	2
623	2	R612 5905-	RESISTOR,	COMP 81349	Same as 622 RC20GF564K	Ref
624	2	R140 5905-	RESISTOR,	COMP 81349	X18414-682 RC20GF684K	2
625	2	R639 5905-	RESISTOR,	COMP 81349	Same as 624 RC20GF684K	Ref
626	2	R538 5905-	RESISTOR,	COMP 81349	X18414-822 RC20GF824K	2
627	2	R539 5905-	RESISTOR,	COMP 81349	Same as 626 RC20GF824K	Ref
628	2	R201 5905-192-0390	RESISTOR,	COMP 81349	X18415-101 RC20GF105J	2
629	2	R234 5905-192-0390	RESISTOR,	COMP 81349	Same as 628 RC20GF105J	Ref
630	2	R205 5905-	RESISTOR,	COMP 81349	X18415-102 RC20GF105K	11
631	2	R236 5905-	RESISTOR,	COMP 81349	Same as 630 RC20GF105K	Ref
632	2	R272 5905-	RESISTOR,	COMP 81349	Same as 630 RC20GF105K	Ref
633	2	R274 5905-	RESISTOR,	COMP 81349	Same as 630 RC20GF105K	Ref
634	2	R407 5905-	RESISTOR,	COMP 81349	Same as 630 RC20GF105K	Ref
635	2	R437 5905-	RESISTOR,	COMP 81349	Same as 630 RC20GF105K	Ref
636	2	R605 5905-	RESISTOR,	COMP 81349	Same as 630 RC20GF105K	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
637	2	R614 5905-	RESISTOR, COMP	81349	Same as 630 RC20GF105K	Ref
638	2	R655 5905-	RESISTOR, COMP	81349	Same as 630 RC20GF105K	Ref
639	2	R721 5905-	RESISTOR, COMP	81349	Same as 630 RC20GF105K	Ref
640	2	R749 5905-	RESISTOR, COMP	81349	Same as 630 RC20GF105K	Ref
641	2	R295 5905-	RESISTOR, COMP	81349	X18415-152 RC20GF155K	7
642	2	R468 5905-	RESISTOR, COMP	81349	Same as 641 RC20GF155K	Ref
643	2	R615 5905-	RESISTOR, COMP	81349	Same as 641 RC20GF155K	Ref
644	2	R625 5905-	RESISTOR, COMP	81349	Same as 641 RC20GF155K	Ref
645	2	R627 5905-	RESISTOR, COMP	81349	Same as 641 RC20GF155K	Ref
646	2	R640 5905-	RESISTOR, COMP	81349	Same as 641 RC20GF155K	Ref
647	2	R760 5905-	RESISTOR, COMP	81349	Same as 641 RC20GF155K	Ref
648	2	R275 5905-279-1873	RESISTOR, COMP	81349	X18415-181 RC20GF185J	1
649	2	R617 5905-	RESISTOR, COMP	81349	X18415-222 RC20GF225K	4
650	2	R628 5905-	RESISTOR, COMP	81349	Same as 649 RC20GF225K	Ref
651	2	R632 5905-	RESISTOR, COMP	81349	Same as 649 RC20GF225K	Ref
652	2	R707 5905-	RESISTOR, COMP	81349	Same as 649 RC20GF225K	Ref
653	2	R658 5905-	RESISTOR, COMP	81349	X18415-272 RC20GF275K	3
654	2	R659 5905-	RESISTOR, COMP	81349	Same as 653 RC20GF275K	Ref
655	2	R754 5905-	RESISTOR, COMP	81349	Same as 653 RC20GF275K	Ref
656	2	R753 5905-	RESISTOR, COMP	81349	X18415-332 RC20GF335K	1
657	2	R302 5905-	RESISTOR, COMP	81349	X18415-472 RC20GF475K	7
658	2	R304 5905-	RESISTOR, COMP	81349	Same as 657 RC20GF475K	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
659	2	R508 5905-	RESISTOR, COMP	81349	Same as 657 RC20GF475K	Ref
660	2	R708 5905-	RESISTOR, COMP	81349	Same as 657 RC20GF475K	Ref
661	2	R709 5905-	RESISTOR, COMP	81349	Same as 657 RC20GF475K	Ref
662	2	R710 5905-	RESISTOR, COMP	81349	Same as 657 RC20GF475K	Ref
663	2	R719 5905-	RESISTOR, COMP	81349	Same as 657 RC20GF475K	Ref
664	2	R499 5905-	RESISTOR, COMP	81349	X18416-222 RC20GF226K	1
665	2	R609 5905-	RESISTOR, COMP	81349	X18420-102 RC32GF100K	5
666	2	R610 5905-	RESISTOR, COMP	81349	Same as 665 RC32GF100K	Ref
667	2	R636 5905-	RESISTOR, COMP	81349	Same as 665 RC32GF100K	Ref
668	2	R646 5905-	RESISTOR, COMP	81349	Same as 665 RC32GF100K	Ref
669	2	R647 5905-	RESISTOR, COMP	81349	Same as 665 RC32GF100K	Ref
670	2	R671 5905-	RESISTOR, COMP	81349	X18420-122 RC32GF120K	1
671	2	R113 5905-	RESISTOR, COMP	81349	X18421-102 RC32GF101K	3
672	2	R114 5905-	RESISTOR, COMP	81349	Same as 671 RC32GF101K	Ref
673	2	R117 5905-	RESISTOR, COMP	81349	Same as 671 RC32GF101K	Ref
674	2	R133 5905-299-2043	RESISTOR, COMP	81349	X18422-201 RC32GF202J	1
675	2	R118 5905-	RESISTOR, COMP	81349	X18422-222 RC32GF222K	1
676	2	R253 5905-	RESISTOR, COMP	81349	X18422-272 RC32GF272K	1
677	2	R252 5905-	RESISTOR, COMP	81349	X18422-332 RC32GF332K	1
678	2	R208 5905-	RESISTOR, COMP	81349	X18422-472 RC32GF472K	3
679	2	R209 5905-	RESISTOR, COMP	81349	Same as 678 RC32GF472K	Ref
680	2	R270 5905-	RESISTOR, COMP	81349	Same as 678 RC32GF472K	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
681	2	R288 5905-	RESISTOR, COMP	81349	X18422-682 RC32GF682K	1
682	2	R530 5905-	RESISTOR, COMP	81349	X18422-821 RC32GF822K	2
683	2	R531 5905-	RESISTOR, COMP	81349	Same as 682 RC32GF822K	Ref
684	2	R438 5905-279-1719	RESISTOR, COMP	81349	X18423-101 RC32GF103J	1
685	2	R651 5905-	RESISTOR, COMP	81349	X18423-152 RC32GF153K	2
686	2	R652 5905-	RESISTOR, COMP	81349	Same as 685 RC32GF153K	Ref
687	2	R738 5905-299-2022	RESISTOR, COMP	81349	X18423-221 RC32GF223J	2
688	2	R743 5905-299-2022	RESISTOR, COMP	81349	Same as 687 RC32GF223J	Ref
689	2	R432 5905-	RESISTOR, COMP	81349	X18423-222 RC32GF223K	1
690	2	R442 5905-102-2740	RESISTOR, COMP	81349	X18423-331 RC32GF333J	1
691	2	R260 5905-	RESISTOR, COMP	81349	X18423-332 RC32GF333K	3
692	2	R409 5905-	RESISTOR, COMP	81349	Same as 691 RC32GF333K	Ref
693	2	R757 5905-	RESISTOR, COMP	81349	Same as 691 RC32GF333K	Ref
694	2	R258 5905-299-2015	RESISTOR, COMP	81349	X18423-391 RC32GF393J	2
695	2	R441 5905-299-2015	RESISTOR, COMP	81349	Same as 694 RC32GF393J	Ref
696	2	R241 5905-	RESISTOR, COMP	81349	X18423-472 RC32GF473K	4
697	2	R410 5905-	RESISTOR, COMP	81349	Same as 696 RC32GF473K	Ref
698	2	R413 5905-	RESISTOR, COMP	81349	Same as 696 RC32GF473K	Ref
699	2	R414 5905-	RESISTOR, COMP	81349	Same as 696 RC32GF473K	Ref
700	2	R256 5905-299-2011	RESISTOR, COMP	81349	X18423-561 RC32GF563J	1
701	2	R630 5905-	RESISTOR, COMP	81349	X18423-822 RC32GF823K	1
702	2	R301 5905-	RESISTOR, COMP	81349	X18424-102 RC32GF104K	2

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
703	2	R504 5905-	RESISTOR, COMP	81349	Same as 702 RC32GF104K	Ref
704	2	R622 5905-	RESISTOR, COMP	81349	X18430-102 RC42GF100K	1
705	2	R704 5905-	RESISTOR, COMP	81349	X18431-392 RC42GF391K	1
706	2	R101 5905-279-2283	RESISTOR, COMP	81349	X18431-911 RC42GF911J	1
707	2	R135 5905-	RESISTOR, COMP	81349	X18432-472 RC42GF472K	1
708	2	R657 5905-	RESISTOR, COMP	81349	X18433-102 RC42GF103K	1
709	2	R456 5905-	RESISTOR, COMP	81349	X18433-122 RC42GF123K	1
710	2	R444 5905-171-1976	RESISTOR, COMP	81349	X18433-151 RC42GF153J	1
711	2	R143 5905-	RESISTOR, COMP	81349	X18433-152 RC42GF153K	2
712	2	R453 5905-	RESISTOR, COMP	81349	Same as 711 RC42GF153K	Ref
713	2	R226 5905-	RESISTOR, COMP	81349	X18433-222 RC42GF223K	6
714	2	R228 5905-	RESISTOR, COMP	81349	Same as 713 RC42GF223K	Ref
715	2	R251 5905-	RESISTOR, COMP	81349	Same as 713 RC42GF223K	Ref
716	2	R292 5905-	RESISTOR, COMP	81349	Same as 713 RC42GF223K	Ref
717	2	R293 5905-	RESISTOR, COMP	81349	Same as 713 RC42GF223K	Ref
718	2	R294 5905-	RESISTOR, COMP	81349	Same as 713 RC42GF223K	Ref
719	2	R122 5905-	RESISTOR, COMP	81349	X18433-272 RC42GF273K	2
720	2	R123 5905-	RESISTOR, COMP	81349	Same as 719 RC42GF273K	Ref
721	2	R212 5905-	RESISTOR, COMP	81349	X18433-332 RC42GF333K	3
722	2	R412 5905-	RESISTOR, COMP	81349	Same as 721 RC42GF333K	Ref
723	2	R419 5905-	RESISTOR, COMP	81349	Same as 721 RC42GF333K	Ref
724	2	R213 5905-	RESISTOR, COMP	81349	X18433-392 RC42GF393K	4

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO. / FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
725	2	R491 5905-	RESISTOR, COMP 81349	Same as 724 RC42GF393K	Ref
726	2	R535 5905-	RESISTOR, COMP 81349	Same as 724 RC42GF393K	Ref
727	2	R536 5905-	RESISTOR, COMP 81349	Same as 724 RC42GF393K	Ref
728	2	R702 5905-	RESISTOR, COMP 81349	X18433-562 RC42GF563K	1
729	2	R722 5905-	RESISTOR, COMP 81349	X18433-682 RC42GF683K	1
730	2	R611 5905-	RESISTOR, COMP 81349	X18433-822 RC42GF823K	1
731	2	R466 5905-	RESISTOR, COMP 81349	X18434-222 RC42GF224K	1
732	2	R726 5905-	RESISTOR, COMP 81349	X18435-102 RC42GF105K	1
733	2	R723 5905-	RESISTOR, COMP 81349	X18435-222 RC42GF225K	2
734	2	R724 5905-	RESISTOR, COMP 81349	Same as 733 RC42GF225K	Ref
735	2	R747 5905-	RESISTOR, COMP 81349	X18435-331 RC42GF335J	1
736	2	R751 5905-665-4364	RESISTOR, COMP 81349	X18435-391 RC42GF395J	1
737	2	R746 5905-279-1900	RESISTOR, COMP 81349	X18435-471 RC42GF475J	2
738	2	R750 5905-279-1900	RESISTOR, COMP 81349	Same as 737 RC42GF475J	Ref
739	2	R119 5905-	RESISTOR, COMP 01121	18525-793 TR0831	2
740	2	R124 5905-	RESISTOR, COMP 01121	Same as 739 TR0831	Ref
741	2	R148 5905-	RESISTOR, COMP 81349	X18450-472 RC07GF470K	1
742	2	R149 5905-	RESISTOR, COMP 81349	X18451-152 RC07GF151K	1
743	2	R147 5905-	RESISTOR, COMP 81349	X18451-222 RC07GF221K	1
744	2	R152 5905-	RESISTOR, COMP 81349	X18452-822 RC07GF822K	2
745	2	R153 5905-	RESISTOR, COMP 81349	Same as 744 RC07GF822K	Ref
746	2	R145 5905-	RESISTOR, COMP 81349	X18455-102 RC07GF105K	2

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
747	2	R151 5905-	RESISTOR, COMP	81349	Same as 746 RC07GF105K	Ref
748	2	R401 5905-	RESISTOR, FILM	19701	18530-4 DC1-2A900K OHMS	2
749	2	R736 5905-	RESISTOR, FILM	19701	Same as 748 DC1-2A900K OHMS	Ref
750	2	R490 5905-284-3707	RESISTOR, FILM	81349	X18530-20 RN20X1503F	2
751	2	R513 5905-284-3707	RESISTOR, FILM	81349	Same as 750 RN20X1503F	Ref
752	2	R286 5905-279-6262	RESISTOR, FILM	81349	X18530-22 RN20X1003F	3
753	2	R287 5905-279-6262	RESISTOR, FILM	81349	Same as 752 RN20X1003F	Ref
754	2	R771 5905-279-6262	RESISTOR, FILM	81349	Same as 752 RN20X1003F	Ref
755	2	R285 5905-	RESISTOR, FILM	19701	18530-35 DC1-2A300K OHMS	2
756	2	R735 5905-	RESISTOR, FILM	19701	Same as 755 DC1-2A300K OHMS	Ref
757	2	R462 5905-	RESISTOR, FILM	19701	18530-36 DC1-2A400K OHMS	1
758	2	R766 5905-	RESISTOR, FILM	19701	18530-76 DC1-2A610 OHMS	1
759	2	R767 5905-	RESISTOR, FILM	81349	X18530-75 RN20X2000F	1
760	2	R768 5905-643-6057	RESISTOR, FILM	81349	X18530-76 RN20X1000F	2
761	2	R772 5905-643-6057	RESISTOR, FILM	81349	Same as 760 RN20X100F	Ref
762	2	R769 5905-	RESISTOR, FILM	19701	18530-77 DC1-2A60 OHMS	1
763	2	R770 5905-	RESISTOR, FILM	19701	18530-78 DC1-2A40 OHMS	1
764	2	R762 5905-	RESISTOR, FILM	19701	18530-80 DC1-2A9500 OHMS	1
765	2	R516 5905-	RESISTOR, FILM	19701	18530-81 DC1-2A10.1K OHMS	1
766	2	R763 5905-	RESISTOR, FILM	19701	18530-82 DC1-2A6370 OHMS	1
767	2	R764 5905-	RESISTOR, FILM	81349	X18530-84 RN20X2101F	1
768	2	R765 5905-	RESISTOR, FILM	81349	X18530-86 RN20X1021F	1

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769	2	R248 5905-	RESISTOR, FILM	19701	18530-88 DC1-2A95K OHMS	2
770	2	R488 5905-	RESISTOR, FILM	19701	Same as 769 DC1-2A95K OHMS	Ref
771	2	R402 5905-	RESISTOR, FILM	19701	18530-89 DC1-2A111K OHMS	1
772	2	R249 5905-	RESISTOR, FILM	19701	18530-90 DC1-2A220K OHMS	1
773	2	R741 5905-	RESISTOR, FILM	81349	X18530-92 RN20X7503F	1
774	2	R283 5905-	RESISTOR, FILM	81349	X18530-95 RN20X1004F	5
775	2	R284 5905-	RESISTOR, FILM	81349	Same as 774 RN20X1004F	Ref
776	2	R404 5905-	RESISTOR, FILM	81349	Same as 774 RN20X1004F	Ref
777	2	R458 5905-	RESISTOR, FILM	81349	Same as 774 RN20X1004F	Ref
778	2	R501 5905-	RESISTOR, FILM	81349	Same as 774 RN20X1004F	Ref
779	2	R502 5905-	RESISTOR, FILM	19701	18530-97 DC1-2A1.23 MEGOHMS	1
780	2	R740 5905-	RESISTOR, FILM	19701	18530-98 DC1-2A95K OHMS	1
781	2	R282 5905-	RESISTOR, FILM	19701	18530-100 DC1-2A3 MEGOHMS	1
782	2	R460 5905-	RESISTOR, FILM	19701	18530-101 DC1-2A600K OHMS	1
783	2	R280 5905-	RESISTOR, FILM	81349	X18531-1 RN25X1005F	2
784	2	R281 5905-	RESISTOR, FILM	81349	Same as 783 RN25X1005F	Ref
785	2	R669 5905-	RESISTOR, FILM	19701	18531-2 DC1-50K OHMS	1
786	2	R666 5905-	RESISTOR, FILM	19701	18531-3 DC1-68K OHMS	1
787	2	R607 5905-	RESISTOR, FILM	19701	18531-4 DC1-220K OHMS	2
788	2	R634 5905-	RESISTOR, FILM	19701	Same as 787 DC1-220K OHMS	Ref
789	2	R633 5905-	RESISTOR, FILM	19701	18531-5 DC1-333K OHMS	2
790	2	R642 5905-	RESISTOR, FILM	19701	Same as 789 DC1-333K OHMS	Ref

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791	2	R643 5905-	RESISTOR,	FILM 19701	18531-7 DC1-490K OHMS	1
792	2	R608 5905-	RESISTOR,	FILM 19701	18531-8 DC1-720K OHMS	1
793	2	R279 5905-	RESISTOR,	FILM 19701	18532-2 DC2-30 MEGOHMS	1
794	2	R621 5905-	RESISTOR,	WW 15909-	18525-790 1195-100000HM1-2	1
795	2	R620 5905-	RESISTOR,	WW 15909	18550-169 1252-236000HM1WAT	1
796	2	R136 5905-	RESISTOR,	WW 63743	18575-218 Z30000WL	1
797	2	R644 5905-	RESISTOR,	WW 63743	18575-219 RW29V751WL	1
798	2	R130 5905-	RESISTOR,	WW 81349	X18575-220 RW30G452	8
799	2	R155 5905-	RESISTOR,	WW 81349	Same as 798 RW30G452	Ref
800	2	R158 5905-	RESISTOR,	WW 81349	Same as 798 RW30G452	Ref
801	2	R161 5905-	RESISTOR,	WW 81349	Same as 798 RW30G452	Ref
802	2	R164 5905-	RESISTOR,	WW 81349	Same as 798 RW30G452	Ref
803	2	R167 5905-	RESISTOR,	WW 81349	Same as 798 RW30G452	Ref
804	2	R170 5905-	RESISTOR,	WW 81349	Same as 798 RW30G452	Ref
805	2	R606 5905-	RESISTOR,	WW 81349	Same as 798 RW30G452	Ref
806	2	R626 5905-299-7979	RESISTOR,	WW 81349	X18575-221 RW29V202	1
807	2	R641 5905-	RESISTOR,	WW 63743	18575-222 RW29V302WL	1
808	2	R265 5905-	RESISTOR,	WW 63743	18575-224 5X8000	2
809	2	R306 5905-	RESISTOR,	WW 63743	Same as 808 5X8000	Ref
810	2	R480 5905-299-1440	RESISTOR,	WW 63743	18575-225 5X10000-5PCT	1

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
811	2	R175 5905-	RESISTOR, WW	63743	18575-227 5X1000	1
812	2	R104 5905-279-7309	RESISTOR, WW	63743	18575-228 5X3000	1
813	2	R508 5905-556-3284	RESISTOR, WW	63743	18575-229 5X4000	1
814	2	R618 5905-	RESISTOR, WW	63743	18575-230 T-2400WL	2
815	2	R619 5905-	RESISTOR, WW	63743	Same as 814 T-2400WL	Ref
816	2	R656 5905-	RESISTOR, WW	63743	18575-231 25F1000	1
817	2	R121 5905-	RESISTOR, WW	63743	18575-232 5X2500	1
818	2	R105 5905-556-5098	RESISTOR, WW	81349	X18575-236 RW29G103	1
819	2	R131 5905-	RESISTOR, WW	63743	18575-237 V167WL	1
820	2	R174 5905-	RESISTOR, WW	81349	X18575-238 RW29G123	1
821	2	R520 5905-	RESISTOR, WW	28569	18577-155	1
822	2	R774 5905-	RESISTOR, WW	28569	18577-156	1
823	2	R102 5905-	RESISTOR, WW	28569	18577-169	2
824	2	R112 5905-	RESISTOR, WW	28569	Same as 823 18577-169	Ref
825	2	R146 5905-	RESISTOR, WW	28569	18577-171	2
826	2	R150 5905-	RESISTOR, WW	28569	Same as 825 18577-171	Ref
827	2	R405 5905-	RESISTOR, VAR	28569	16925-343	2
828	2	R415 A & B 5905-	RESISTOR, VAR	28569	Same as 827 16925-343	Ref
829	2	R214 5905-	RESISTOR, VAR	28569	16925-344	2
830	2	RS242 5905-	RESISTOR, VAR	28569	Same as 829 16925-344	Ref
831	2	R511 5905-	RESISTOR, VAR	28569	16925-345	2
832	2	R512 5905-	RESISTOR, VAR	28569	Same as 831 16925-345	Ref

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
833	2	R748 5905-	RESISTOR, VAR	28569	16925-346	1
834	2	R725 5905-	RESISTOR, VAR	28569	16925-347	1
835	2	R290 5905-	RESISTOR, VAR	28569	16925-349	1
836	2	R259 5905-	RESISTOR, VAR	28569	16925-350	1
837	2	R670 5905-583-5152	RESISTOR, VAR	81349	X16925-351 RA20NASD500A	1
838	2	R481 5905-617-8016	RESISTOR, VAR	81349	X16925-352 RA20NASD103A	2
839	2	R667 5905-617-8016	RESISTOR, VAR	81349	Same as 838 RA20NASD103A	Ref
840	2	R454 5905-	RESISTOR, VAR	81349	X40101-103 RV4NAYSD103B	2
841	2	R667 5905-	RESISTOR, VAR	81349	Same as 840 RV4NAYSD103B	Ref
842	2	R233 5905-	RESISTOR, VAR	81349	X40101-104 RV4NAYSD104B	4
843	2	R243 5905-	RESISTOR, VAR	81349	Same as 842 RV4NAYSD104B	Ref
844	2	R473 5905-	RESISTOR, VAR	81349	Same as 842 RV4NAYSD104B	Ref
845	2	R731 5905-	RESISTOR, VAR	81349	Same as 842 RV4NAYSD104B	Ref
846	2	R289 5905-	RESISTOR, VAR	81349	X40101-153 RV4NAYSD153B	1
847	2	R108 5905-	RESISTOR, VAR	81349	X40101-201 RV4NAYSD201B	1
848	2	R706 5905-	RESISTOR, VAR	81349	X40101-205 RV4NAYSD205B	1
849	2	R307 5905-	RESISTOR, VAR	81349	X40101-252 RV4NAYSD252B	2
850	2	R529 5905-	RESISTOR, VAR	81349	Same as 849 RV4NAYSD252B	Ref
851	2	R519 5905-	RESISTOR, VAR	81349	X40101-253 RV4NAYSD253B	1
852	2	R126 5905-	RESISTOR, VAR	81349	X40101-254 RV4NAYSD254B	1
853	2	R745 5905-	RESISTOR, VAR	81349	X40101-255 RV4NAYSD255B	1
854	2	R227 5905-	RESISTOR, VAR	81349	X40101-501 RV4NAYSD255B	1

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME	PRIME CONTRACTOR'S PART NUMBER	QTY END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO. / FED. MFR. CODE	MANUFACTURERS PART NUMBER	USABLE ON CODE
855	2	R204 5905-	RESISTOR, VAR 81349	X40101-503 RV4NAYSD503B	4
856	2	R411 5905-	RESISTOR, VAR 81349	Same as 855 RV4NAYSD503B	Ref
857	2	R528 5905-	RESISTOR, VAR 81349	Same as 855 RV4NAYSD503B	Ref
858	2	R730 5905-	RESISTOR, VAR 81349	Same as 855 RV4NAYSD503B	Ref
859	2	R482 5905-	RESISTOR, VAR 73138	16925-362 AR30KL.1	1
860	2	H121 5960-	RETAINER, TUBE 28569	3275-261	1
861	2	E104 5960-	RETAINER, SH'LD 71785	2175-88 20K14651	
862	2	E105 5960-	RETAINER, SH'LD 71785	Same as 861 20K14651	Ref
863	2	E106 5960-284-4342	RETAINER, SH'LD 71785	2175-89 1093A	1
864	2	H122 5340-	RING, RETAINING 97464	18700-14 1000-18-SS	1
865	2	H123 6625-	SCALE, CRT 28569	19020-24	1
866	2	H145	SHAFT, ROT'Y SW 28569	19100-114	1
867	2	H146	SHAFT, ROT'Y SW 28569	19100-115	1
868	2	E101 5960-262-0015	SHIELD, TUBE 81350	19155-136 TS102U01	1
869	2	E103 5960-265-0573	SHIELD, TUBE 81350	19155-141 TS103U03	1
870	2	E130 5960-	SHIELD, TUBE 28569	19155-320	1
871	2	XV603 5935-	SOCKET, TUBE 81350	19350-168 TS101P01	3
872	2	XV605 5935-	SOCKET, TUBE 81350	Same as 871 TS101P01	Ref
873	2	XV701 5935-	SOCKET, TUBE 81350	Same as 871 TS101P01	Ref
874	2	XV107 5935-581-7061	SOCKET, TUBE 71785	19350-298 44F16388	37
875	2	XV108 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
876	2	XV201 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME	PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO. / FED MFR. CODE	MANUFACTURERS PART NUMBER	USABLE ON CODE
877	2	XV202 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
878	2	XV203 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
879	2	XV204 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
880	2	XV205 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
881	2	XV206 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
882	2	XV207 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
883	2	XV210 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
884	2	XV211 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
885	2	XV212 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
886	2	XV401 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
887	2	XV402 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
888	2	XV403 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
889	2	XV404 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
890	2	XV405 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
891	2	XV406 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
892	2	XV407 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
893	2	XV413 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
894	2	XV414 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
895	2	XV501 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
896	2	XV502 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
897	2	XV503 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref
898	2	XV504 5935-581-7061	SOCKET, TUBE 71785	Same as 874 44F16388	Ref

ITEM OR SEQNCE NO.	INDENT	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	USABLE ON CODE
899	2	XV505 5935-581-7061	SOCKET, TUBE	71785	Same as 874 44F16388	Ref
900	2	XV601 5935-581-7061	SOCKET, TUBE	71785	Same as 874 44F16388	Ref
901	2	XV607 5935-581-7061	SOCKET, TUBE	71785	Same as 874 44F16388	Ref
902	2	XV609 5935-581-7061	SOCKET, TUBE	71785	Same as 874 44F16388	Ref
903	2	XV610 5935-581-7061	SOCKET, TUBE	71785	Same as 874 44F16388	Ref
904	2	XV611 5935-581-7061	SOCKET, TUBE	71785	Same as 874 44F16388	Ref
905	2	XV614 5935-581-7061	SOCKET, TUBE	71785	Same as 874 44F16388	Ref
906	2	XV702 5935-581-7061	SOCKET, TUBE	71785	Same as 874 44F16388	Ref
907	2	XV708 5935-581-7061	SOCKET, TUBE	71785	Same as 874 44F16388	Ref
908	2	XV710 5935-581-7061	SOCKET, TUBE	71785	Same as 874 44F16388	Ref
909	2	XV751 5935-581-7061	SOCKET, TUBE	71785	Same as 874 44F16388	Ref
910	2	XS603 5935-581-7061	SOCKET, TUBE	71785	Same as 874 44F16388	Ref
911	2	XV105 5935-	SOCKET, TUBE	71785	19350-299 53C17004	26
912	2	XV106 5935-	SOCKET, TUBE	71785	Same as 911 53C17004	Ref
913	2	XV109 5935-	SOCKET, TUBE	71785	Same as 911 53C17004	Ref
914	2	XV110 5935-	SOCKET, TUBE	71785	Same as 911 53C17004	Ref
915	2	XV111 5935-	SOCKET, TUBE	71785	Same as 911 53C17004	Ref
916	2	XV112 5935-	SOCKET, TUBE	71785	Same as 911 53C17004	Ref
917	2	XV113 5935-	SOCKET, TUBE	71785	Same as 911 53C17004	Ref
918	2	XV114 5935-	SOCKET, TUBE	71785	Same as 911 53C17004	Ref
919	2	XV115 5935-	SOCKET, TUBE	71785	Same as 911 53C17004	Ref
920	2	XV116 5935-	SOCKET, TUBE	71785	Same as 911 53C17004	Ref

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME	PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO. / FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
921	2	XV117 5935-	SOCKET, TUBE 71785	Same as 911 53C17004	Ref
922	2	XV118 5935-	SOCKET, TUBE 71785	Same as 911 53C17004	Ref
923	2	XV119 5935-	SOCKET, TUBE 71785	Same as 911 53C17004	Ref
924	2	XV120 5935-	SOCKET, TUBE 71785	Same as 911 53C17004	Ref
925	2	XV208 5935-	SOCKET, TUBE 71785	Same as 911 53C17004	Ref
926	2	XV209 5935-	SOCKET, TUBE 71785	Same as 911 53C17004	Ref
927	2	XV408 5935-	SOCKET, TUBE 71785	Same as 911 53C17004	Ref
928	2	XV409 5935-	SOCKET, TUBE 71785	Same as 911 53C17004	Ref
929	2	XV411 5935-	SOCKET, TUBE 71785	Same as 911 53C17004	Ref
930	2	XV412 5935-	SOCKET, TUBE 71785	Same as 911 53C17004	Ref
931	2	XV602 5935-	SOCKET, TUBE 71785	Same as 911 53C17004	Ref
932	2	XV604 5935-	SOCKET, TUBE 71785	Same as 911 53C17004	Ref
933	2	XV606 5935-	SOCKET, TUBE 71785	Same as 911 53C17004	Ref
934	2	XV608 5935-	SOCKET, TUBE 71785	Same as 911 53C17004	Ref
935	2	XV612 5935-	SOCKET, TUBE 71785	Same as 911 53C17004	Ref
936	2	XV613 5935-	SOCKET, TUBE 71785	Same as 911 53C17004	Ref
937	2	XV709 5935-173-5720	SOCKET, TUBE 71785	19350-301 9453	1
938	2	XV101 5935-	SOCKET, TUBE 28569	19350-326	4
939	2	XV102 5935-	SOCKET, TUBE 28569	Same as 938 19350-326	Ref
940	2	XV103 5935-	SOCKET, TUBE 28569	Same as 938 19350-326	Ref
941	2	XV104 5935-	SOCKET, TUBE 28569	Same as 938 19350-326	Ref
942	2	S404 5930-	SWITCH, PUSH 70611	19910-136 7716B7	1

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	USABLE ON CODE
943	2	S501 5930-	SWITCH, ROTARY	28569	19912-393	1
944	2	S403 5930-	SWITCH, ROTARY	28569	19912-394	1
945	2	S203-502 5930-	SWITCH, ROTARY	28569	19912-395	1
946	2	S204 5930-	SWITCH, ROTARY	28569	19912-396	1
947	2	S751-752 5930-	SWITCH, ROTARY	28569	19912-397	1
948	2	S201-202 5930-	SWITCH, ROTARY	28569	19912-411	1
949	2	S602 5930-	SWITCH, THERMO	81439	19913-3 6240	1
950	2	S601 5930-	SWITCH, TOGGLE	81349	19911-14 MS25098-22	1
951	2	S401 5930-	SWITCH, TOGGLE	81349	19911-67 MS25100-23	2
952	2	S402 5930-	SWITCH, TOGGLE	81349	Same as 951 MS25100-23	Ref
953	2	E150 5940-	TERMINAL STRIP	28569	20352-4	1
954	2	E653 5940-	TERMINAL STRIP	28569	20352-7	2
955	2	E654 5940-	TERMINAL STRIP	28569	Same as 954 20352-7	Ref
956	2	E461 5940-	TERMINAL STRIP	28569	20352-11	1
957	2	E751 5940-	TERMINAL STRIP	28569	20352-202	5
958	2	E752 5940-	TERMINAL STRIP	28569	Same as 957 20352-202	Ref
959	2	E753 5940-	TERMINAL STRIP	28569	Same as 957 20352-202	Ref
960	2	E754 5940-	TERMINAL STRIP	28569	Same as 957 20352-202	Ref
961	2	E755 5940-	TERMINAL STRIP	28569	Same as 957 20352-202	Ref
962	2	E650 5940-	TERMINAL STRIP	28569	20352-203	1
963	2	E250 5940-	TERMINAL STRIP	28569	20352-204	6
964	8	E251 5940-	TERMINAL STRIP	28569	Same as 963 20352-204	Ref

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
965	2	E450 5940-	TERMINAL STRIP	28569	Same as 963 20352-204	Ref
966	2	E651 5940-	TERMINAL STRIP	28569	Same as 963 20352-204	Ref
967	2	E652 5940-	TERMINAL STRIP	28569	Same as 963 20352-204	Ref
968	2	E750 5940-	TERMINAL STRIP	28569	Same as 963 20352-204	Ref
969	2	E153 5940-	TERMINAL STRIP	28569	20352-207	14
970	2	E252 5940-	TERMINAL STRIP	28569	Same as 969 20352-207	Ref
971	2	E253 5940-	TERMINAL STRIP	28569	Same As 969 20352-207	Ref
972	2	E254 5940-	TERMINAL STRIP	28569	Same as 969 20352-207	Ref
973	2	E255 5940-	TERMINAL STRIP	28569	Same as 969 20352-207	Ref
974	2	E256 5940-	TERMINAL STRIP	28569	Same as 969 20352-207	Ref
975	2	E257 5940-	TERMINAL STRIP	28569	Same as 969 20352-207	Ref
976	2	E258 5940-	TERMINAL STRIP	28569	Same as 969 20352-207	Ref
977	2	E259 5940-	TERMINAL STRIP	28569	Same as 969 20352-207	Ref
978	2	E451 5940-	TERMINAL STRIP	28569	Same as 969 20352-207	Ref
979	2	E452 5940-	TERMINAL STRIP	28569	Same as 969 20352-207	Ref
980	2	E453 5940-	TERMINAL STRIP	28569	Same as 969 20352-207	Ref
981	2	E454 5940-	TERMINAL STRIP	28569	Same as 969 20352-207	Ref
982	2	E756 5940-	TERMINAL STRIP	28569	Same as 969 20352-207	Ref
983	2	E154 5940-	TERMINAL STRIP	28569	20352-211	33
984	2	E155 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
985	2	E156 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
986	2	E157 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	USABLE ON CODE
987	2	E260 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
988	2	E261 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
989	2	E262 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
990	2	E263 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
991	2	E264 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
992	2	E265 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
993	2	E266 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
994	2	E267 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
995	2	E268 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
996	2	E269 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
997	2	E455 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
998	2	E456 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
999	2	E457 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
1000	2	E458 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
1001	2	E459 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
1002	2	E460 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
1003	2	E655 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
1004	2	E656 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
1005	2	E657 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
1006	2	E658 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
1007	2	E659 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
1008	2	E660 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
1009	2	E661 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
1010	2	E662 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
1011	2	E663 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
1012	2	E664 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
1013	2	E758 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
1014	2	E759 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
1015	2	E760 5940-	TERMINAL STRIP	28569	Same as 983 20352-211	Ref
1016	2	E151 5940-	TERMINAL STRIP	28569	20352-401	2
1017	2	E152 5940-	TERMINAL STRIP	28569	Same as 1016 20352-401	Ref
1018	2	T601 5950-	TRANSFORMER	28569	20800-226	1
1019	2	T701 5950-	TRANSFORMER	28569	20800-234	1

PRELIMINARY PARTS LIST

PREAMPLIFIER, MODEL NO. 1822

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME	PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO. / FED. MFR. CODE	MANUFACTURERS PART NUMBER	USABLE ON CODE
1	1		PREAMPLIFIER 28569	902-334	
2	2	H1001	BRACKET, ANGLE 28569	2660-790	1
3	2	H1002	BRACKET, ANGLE 28569	2660-834	1
4	2	H1003	BUSHING, THD 28569	2900-55	3
5	2	C1028 5910-538-7424	CAPACITOR 81349	X3110-64 CK63Y103Z	2
6	2	C1030 5910-538-7424	CAPACITOR 81349	Same as 5 CK63Y103Z	Ref
7	2	C1016 5910-275-6434	CAPACITOR 81349	X3110-65 CK62Y472Z	5
8	2	C1017 5910-275-6434	CAPACITOR 81349	Same as 7 CK62Y472Z	Ref
9	2	C1027 5910-275-6434	CAPACITOR 81349	Same as 7 CK62Y472Z	Ref
10	2	C1032- 5910-275-6434	CAPACITOR 81349	Same as 7 CK62Y472Z	Ref
11	2	C1033 5910-275-6434	CAPACITOR 81349	Same as 7 CK62Y472Z	Ref
12	2	C1001 5910-552-1939	CAPACITOR 81349	X3110-88 CC20CH080D	1
13	2	C1011 5910-	CAPACITOR 72982	3110-107 Z5U0102P	5
14	2	C1015 5910-	CAPACITOR 72982	Same as 13 Z5U0102P	Ref
15	2	C1020 5910-	CAPACITOR 72982	Same as 13 Z5U0102P	Ref
16	2	C1026 5910-	CAPACITOR 72982	Same as 13 Z5U0102P	Ref
17	2	C1031 5910-	CAPACITOR 72982	Same as 13 Z5U0102P	Ref
18	2	C1008 5910-	CAPACITOR 72982	3110-114 GP2A270 ± 54 uuf	1
19	2	C1019 A-B & C 5910-	CAPACITOR 14655	3085-104 UP11135	1
20	2	C1024 5910-	CAPACITOR 14655	3085-105 BBR275-6	2

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
21	2	C1025 5910-	CAPACITOR	14655	Same as 20 BBR275-6	Ref
22	2	C1004 5910-	CAPACITOR	81349	X3095-119 CM20D251J	1
23	2	C1007 5910-101-5590	CAPACITOR	81349	X3095-120 CM20C151J	1
24	2	C1029 5910-	CAPACITOR	56289	3105-244 109P47304	1
25	2	C1014 5910-	CAPACITOR	56289	3105-267 109P10406	2
26	2	C1021 5910-	CAPACITOR	56289	Same as 25 109P10406	Ref
27	2	C1003 5910-	CAPACITOR	72982	3115-16 503-27NP01.5-7 uuf	3
28	2	C1018 5910-	CAPACITOR	72982	Same as 27 503-27NP01.5-7 uuf	Ref
29	2	C1023 5910-	CAPACITOR	72982	Same as 27 503-27NP01.5-7 uuf	Ref
30	2	C1002 5910-	CAPACITOR	72982	3115-20 503-27NP04.5-25 uuf	5
31	2	C1005 5910-	CAPACITOR	72982	Same as 30 503-27NP04.5-25 uuf	Ref
32	2	C1006 5910-	CAPACITOR	72982	Same as 30 503-27NP04.5-25 uuf	Ref
33	2	C1010 5910-	CAPACITOR	72982	Same as 30 503-27NP04.5-25 uuf	Ref
34	2	C1013 5910-	CAPACITOR	72982	Same as 30 503-27NP04.5-25 uuf	Ref
35	2	C1009 5910-	CAPACITOR	72982	3115-23 503-27NP03-12 uuf	2
36	2	C1012 5910-	CAPACITOR	72982	Same as 35 503-27NP03-12 uuf	Ref
37	2	H1004 5340-	CLAMP, LOOP	28569	3275-270	2
38	2	H1005 5340-	CLAMP, LOOP	83330	3275-272 839	2
39	2	L1005 5950-	COIL, RF	28569	3320-146	3
40	2	L1007 5950-	COIL, RF	28569	Same as 39 3320-146	Ref
41	2	L1008 5950-	COIL, RF	28569	Same as 39 3320-146	Ref
42	2	L1001 5950-	COIL, RF	28569	3320-172	1

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME	PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO. / FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
43	2	L1002 5950-	COIL, RF 28569	3320-173	1
44	2	L1004 5950-	COIL, RF 28569	3320-174	2
45	2	L1006 5950-	COIL, RF 28569	Same as 44 3320-174	Ref
46	2	L1003 5950-	COIL, RF 28569	3320-175	1
47	2	J1001 5935-259-0148	CONNECTOR 02660	3475-12 83-1R	2
48	2	J1002 5935-259-0148	CONNECTOR 02660	Same as 47 83-1R	Ref
49	2	J1003 5935-259-3606	CONNECTOR 02660	16525-162 26-159-16	1
50	2	V1003 5960-262-0296	ELECTRON TUBE 82219	20875-70 12AU6	3
51	2	V1004 5960-262-0296	ELECTRON TUBE 82219	Same as 50 12AU6	Ref
52	2	V1005 5960-262-0296	ELECTRON TUBE 82219	Same as 50 12AU6	Ref
53	2	V1006 5960-	ELECTRON TUBE 86684	20875-77 12AT7	1
54	2	V1002 5960-262-3781	ELECTRON TUBE 86684	20875-179 6BQ7A	1
55	2	V1001 5960-	ELECTRON TUBE 81349	X20875-184 5654-6AK5W	1
56	2	H1006 5355-	KNOB 28569	11505-89	1
57	2	H1007 5355-	KNOB 28569	11505-90	1
58	2	H1008 5355-	KNOB 28569	11505-91	2
59	2	H1009 5355-	KNOB 28569	11505-94	1
60	2	E1001 5940-	POST, BINDING 28569	2360-86	2
61	2	E1002 5940-	POST, BINDING 28569	Same as 60 2360-86	Ref
62	2	CR1001 6130-	RECTIFIER 77638	18150-55 D6-5442H9	1
63	2	R1004 5905-	RESISTOR, COMP 81349	X18410-102 RC20GF100K	1

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
64	2	R1010 5905-	RESISTOR, COMP	81349	X18410-222 RC20GF220K	1
65	2	R1001 5905-	RESISTOR, COMP	81349	X18410-272 RC20GF270K	3
66	2	R1002 5905-	RESISTOR, COMP	81349	Same as 65 RC20GF270K	Ref
67	2	R1005 5905-	RESISTOR, COMP	81349	Same as 65 RC20GF270K	Ref
68	2	R1003 5905-	RESISTOR, COMP	81349	X18410-472 RC20GF470K	5
69	2	R1018 5905-	RESISTOR, COMP	81349	Same as 68 RC20GF470K	Ref
70	2	R1032 5905-	RESISTOR, COMP	81349	Same as 68 RC20GF470K	Ref
71	2	R1034 5905-	RESISTOR, COMP	81349	Same as 68 RC20GF470K	Ref
72	2	R1040 5905-	RESISTOR, COMP	81349	Same as 68 RC20GF470K	Ref
73	2	R1017 5905-	RESISTOR, COMP	81349	X18411-102 RC20GF101K	4
74	2	R1023 5905-	RESISTOR, COMP	81349	Same as 73 RC20GF101K	Ref
75	2	R1061 5905-	RESISTOR, COMP	81349	Same as 73 RC20GF101K	Ref
76	2	R1065 5905-	RESISTOR, COMP	81349	Same as 73 RC20GF101K	Ref
77	2	R1024 5905-	RESISTOR, COMP	81349	X18411-332 RC20GF331K	1
78	2	R1021 5905-	RESISTOR, COMP	81349	X18411-472 RC20GF471K	1
79	2	R1027 5905-	RESISTOR, COMP	81349	X18412-152 RC20GF152K	1
80	2	R1022 5905-279-1751	RESISTOR, COMP	81349	X18412-301 RC20GF302J	1
81	2	R1049 5905-	RESISTOR, COMP	81349	X18413-102 RC20GF103K	1
82	2	R1016 5905-	RESISTOR, COMP	81349	X18414-102 RC20GF104K	1
83	2	R1031 5905-192-3981	RESITOR, COMP	81349	X18414-121 RC20GF124J	1
84	2	R1050 5905-	RESISTOR, COMP	81349	X18414-122 RC20GF124K	4
85	2	R1053 5905-	RESISTOR, COMP	81349	Same as 84 RC20GF124K	Ref

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	USABLE ON CODE
86	2	R1054 5905-	RESISTOR, COMP	81349	Same as 84 RC20GF124K	Ref
87	2	R1057 5905-	RESISTOR, COMP	81349	Same as 84 RC20GF124K	Ref
88	2	R1029 5905-279-2522	RESISTOR, COMP	81349	X18414-151 RC20GF154J	1
89	2	R1026 5905-	RESISTOR, COMP	81349	X18414-332 RC20GF334K	1
90	2	R1038 5905-	RESISTOR, COMP	81349	X18420-122 RC32GF120K	1
91	2	R1044 5905-279-2650	RESISTOR, COMP	81349	X18422-561 RC32GF562J	2
92	2	R1045 5905-279-2650	RESISTOR, COMP	81349	Same as 91 RC32GF562J	Ref
93	2	R1048 5905-	RESISTOR, COMP	81349	X18422-822 RC32GF822K	1
94	2	R1060 5905-299-2032	RESISTOR, COMP	81349	X18422-911 RC32GF912J	4
95	2	R1063 5905-299-2032	RESISTOR, COMP	81349	Same as 94 RC32GF912J	Ref
96	2	R1064 5905-299-2032	RESISTOR, COMP	81349	Same as 94 RC32GF912J	Ref
97	2	R1066 5905-299-2032	RESISTOR, COMP	81349	Same as 94 RC32GF912J	Ref
98	2	R1019 5905-	RESISTOR, COMP	81349	X18423-392 RC32GF393K	1
99	2	R1059 5905-	RESISTOR, COMP	81349	X18430-392 RC42GF390K	1
100	2	R1067 5905-	RESISTOR, COMP	81349	X18432-392 RC42GF392K	1
101	2	R1028 5905-	RESISTOR, COMP	81349	X18432-682 RC42GF682K	1
102	2	R1020 5905-239-0568	RESISTOR, COMP	81349	X18433-221 RC42GF223J	1
103	2	R1037 5905-101-7586	RESISTOR, COMP	81349	X18550-173 RC32GF4R7J	1
104	2	R1008 5905-	RESISTOR, FILM	19701	18530-4 DC1-2A900K OHMS	1
105	2	R1039 5905-	RESISTOR, FILM	19701	18530-6 DC1-2A700 OHMS	2
106	2	R1046 5905-	RESISTOR, FILM	19701	Same as 105 DC1-2A700 OHMS	Ref
107	2	R1012 5905-	RESISTOR, FILM	19701	18530-23 DC1-2A500K OHMS	1

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME	PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO. / FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
108	2	R1007 5905-	RESISTOR, FILM 19701	18530-81 DC1-2A10.1K OHMS	1
109	2	R1014 5905-	RESISTOR, FILM 19701	18530-92 DC1-2A750K OHMS	1
110	2	R1011 5905-	RESISTOR, FILM 19701	18530-95 DC1-2A1 MEGOHM	3
111	2	R1015 5905-	RESISTOR, FILM 19701	Same as 110 DC1-2A1 MEGOHM	Ref
112	2	R1030 5905-	RESISTOR, FILM 19701	Same as 110 DC1-2A1 MEGOHM	Ref
113	2	R1006 5905-	RESISTOR, FILM 19701	19530-96 DC1-2A990K OHMS	1
114	2	R1043 5905-	RESISTOR, WW 63743	18575-223 5X6000	1
115	2	R1047 5905-556-3284	RESISTOR, WW 63743	18575-229 5X4000	1
116	2	R1035 5905-	RESISTOR, WW 63743	18575-239 10X20000WL	1
117	2	R1058 5905-	RESISTOR, WW 63743	18575-240 5X70WL	1
118	2	R1051 A - B 5905-	RESISTOR, VAR 28569	16925-341	1
119	2	R1052 A - B 5905-	RESISTOR, VAR 28569	16925-342	1
120	2	R1042 5905-	RESISTOR, VAR 28569	16925-357	1
121	2	R1041 5905-	RESISTOR, VAR 28569	16925-361	1
122	2	R1033 5905-	RESISTOR, VAR 81349	X40101-101 RV4NAYSD101B	2
123	2	R1036 5905-	RESISTOR, VAR 81349	Same as 122 RV4NAYSD101B	Ref
124	2	R1025 5905-	RESISTOR, VAR 81349	X40101-205 RV4NAYSD205B	1
125	2	R1062 5905-	RESISTOR, VAR 81349	X40101-502 RV4NAYSD502B	1
126	2	H1010 5340-	RING, RETAINING 97464	18700-14 1000-18-SS	1
127	2	H1011	SHAFT, LOCKING 28569	19100-113	1
128	2	H1012	SHAFT, EXT, POT 28569	19100-125	1
129	2	XV1001 5935-260-0516	SOCKET, TUBE 81350	X19350-120 TS102P01	1

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
130	2	XV1002 5935-581-7061	SOCKET, TUBE	71785	19350-298 44F16388	2
131	2	XV1006 5935-581-7061	SOCKET, TUBE	71785	Same as 130 44F16388	Ref
132	2	XV1003 5935-	SOCKET, TUBE	71785	19350-299 53C17004	1
133	2	XV1004 5935-	SOCKET, TUBE	71785	19350-300 53C13256	2
134	2	XV1005 5935-	SOCKET, TUBE	71785	Same as 133 53C13256	Ref
135	2	S1001 5930-	SWITCH, ROTARY	28569	19912-405	1
136	2	S1002 5930-	SWITCH, ROTARY	28569	19912-406	1
137	2	E1050 5940-	TERMINAL STRIP	28569	20352-4	1
138	2	E1051 5940-	TERMINAL STRIP	28569	20352-7	2
139	2	E1052 5940-	TERMINAL STRIP	28569	Same as 138 20352-7	Ref
140	2	E1053 5940-	TERMINAL STRIP	28569	20352-11	1
141	2	E1054 5940-	TERMINAL STRIP	28569	20352-204	2
142	2	E1055 5940-	TERMINAL STRIP	28569	Same as 141 20352-204	Ref

PRELIMINARY PARTS LIST

PREAMPLIFIER, MODEL NO. 1823

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	USABLE ON CODE
	1		PREAMPLIFIER	28569	902-335	
1	2	H143	BRACKET, ANGLE	28569	2660-790	1
2	2	H102 4730-	BUSHING, MACH THD	28569	2900-55	4
3	2	C886 5910-538-7424	CAPACITOR	81349	X3110-64 CK63Y103Z	2
4	2	C887 5910-538-7424	CAPACITOR	81349	same as 3 CK63Y103Z	Ref
5	2	C868 5910-275-6434	CAPACITOR	81349	X3110-65 CK62Y472Z	7
6	2	C870 5910-275-6434	CAPACITOR	81349	same as 5 CK62Y472Z	Ref
7	2	C878 5910-275-6434	CAPACITOR	81349	same as 5 CK62Y472Z	Ref
8	2	C888 5910-275-6434	CAPACITOR	81349	same as 5 CK62Y472Z	Ref
9	2	C889 5910-275-6434	CAPACITOR	81349	same as 5 CK62Y472Z	Ref
10	2	C890 5910-275-6434	CAPACITOR	81349	same as 5 CK62Y472Z	Ref
11	2	C891 5910-275-6434	CAPACITOR	81349	same as 5 CK62Y472Z	Ref
12	2	C807 5910-	CAPACITOR	72982	3110-86 NP0A3.3 $\pm$ .25 uuf	4
13	2	C808 5910-	CAPACITOR	72982	same as 12 NP0A3.3 $\pm$ .25 uuf	Ref
14	2	C838 5910-	CAPACITOR	72982	same as 12 NP0A3.3 $\pm$ .25 uuf	Ref
15	2	C839 5910-	CAPACITOR	72982	same as 12 NP0A3.3 $\pm$ .25 uuf	Ref
16	2	C804 5910-652-1939	CAPACITOR	81349	X3110-88 CC20CH080D	1
17	2	C835 5910-	CAPACITOR	72982	3110-89 NP0A10 $\pm$ 1.0 uuf	1
18	2	C883 5910-171-3172	CAPACITOR	81349	X3110-90 CC20SL120K	2
19	2	C884 5910-171-3172	CAPACITOR	81349	same as 18 CC20SL120K	Ref

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
20	2	C812 5910-	CAPACITOR	72982	3110-92 NP0A22 ± 10%	2
21	2	C843 5910-	CAPACITOR	72982	same as 20 NP0A22 ± 10%	Ref
22	2	C869 5910-	CAPACITOR	81349	X3110-97 CC20SL470M	2
23	2	C879 5910-	CAPACITOR	81349	same as 22 CC20SL470M	Ref
24	2	C815 5910-	CAPACITOR	72982	3110-98 NP0T47uuf ± 10%	8
25	2	C818 5910-	CAPACITOR	72982	same as 24 NP0T47uuf ± 10%	Ref
26	2	C819 5910-	CAPACITOR	72982	same as 24 NP0T47uuf ± 10%	Ref
27	2	C846 5910-	CAPACITOR	72982	same as 24 NP0T47uuf ± 10%	Ref
28	2	C850 5910-	CAPACITOR	72982	same as 24 NP0T47uuf ± 10%	Ref
29	2	C851 5910-	CAPACITOR	72982	same as 24 NP0T47uuf ± 10%	Ref
30	2	C881 5910-	CAPACITOR	72982	same as 24 NP0T47uuf ± 10%	Ref
31	2	C882 5910-	CAPACITOR	72982	same as 24 NP0T47uuf ± 10%	Ref
32	2	C801 5910-	CAPACITOR	72982	3110-100 GP2A150uuf ± 20%	2
33	2	C832 5910-	CAPACITOR	72982	same as 32 GP2A150uuf ± 20%	Ref
34	2	C828 5910-	CAPACITOR	81349	X3110-102 CK20SK1R5D	3
35	2	C852 5910	CAPACITOR	81349	same as 34 CK20SK1R5D	Ref
36	2	C856 5910	CAPACITOR	81349	same as 34 CK20SK1R5D	Ref
37	2	C811 5910-	CAPACITOR	72982	3110-103 NP0A2.2 ± .5 uuf	3
38	2	C842 5910-	CAPACITOR	72982	same as 37 NP0A2.2 ± .5 uuf	Ref
39	2	C860 5910-	CAPACITOR	72982	same as 37 NP0A2.2 ± .5 uuf	Ref
40	2	C820 5910-296-6193	CAPACITOR	78488	3110-105 GA2	3
41	2	C824 5910-296-6193	CAPACITOR	78488	same as 40 GA2	Ref

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
42	2	C847 5910-296-6193	CAPACITOR	78488	same as 40 GA2	Ref
43	2	C871 5910-	CAPACITOR	72982	3110-107 Z5U0102P	2
44	2	C872 5910-	CAPACITOR	72982	same as 43 Z5U0102P	Ref
45	2	C866 5910-	CAPACITOR	71590	3110-109 DA149-002CB-6	2
46	2	C876 5910-	CAPACITOR	71590	same as 45 DA149-002CB-6	Ref
47	2	C823 5910-	CAPACITOR	72982	3095-105 370CB250 ± 25 uuf	2
48	2	C825 5910-	CAPACITOR	72982	same as 47 370CB250 ± 25 uuf	Ref
49	2	C827 5910-	CAPACITOR	72982	3095-106 370CB500 ± 50 uuf	2
50	2	C859 5910-	CAPACITOR	72982	same as 49 370CB500 ± 50 uuf	Ref
51	2	C831 5910-	CAPACITOR	72982	3095-107 370CB750 ± 75 uuf	2
52	2	C863 5910-	CAPACITOR	72982	same as 51 370CB750 ± 75 uuf	Ref
53	2	C864 5910-	CAPACITOR	82376	3105-245 MQLF-6-1	2
54	2	C865 5910-	CAPACITOR	82376	same as 53 MQLF-6-1	REF
55	2	C802 5910-	CAPACITOR	72982	3115-25 535-17	34
56	2	C803 5910-	CAPACITOR	72982	same as 55 535-17	Ref
57	2	C805 5910-	CAPACITOR	72982	same as 55 535-17	Ref
58	2	C806 5910-	CAPACITOR	72982	same as 55 535-17	Ref
59	2	C809 5910-	CAPACITOR	72982	same as 55 535-17	Ref
60	2	C810 5910-	CAPACITOR	72982	same as 55 535-17	Ref
61	2	C813 5910-	CAPACITOR	72982	same as 55 535-17	Ref
62	2	C814 5910-	CAPACITOR	72982	same as 55 535-17	Ref
63	2	C816 5910-	CAPACITOR	72982	same as 55 535-17	Ref

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
64	2	C817 5910-	CAPACITOR	72982	same as 55 535-17	Ref
65	2	C821 5910-	CAPACITOR	72982	same as 55 535-17	Ref
66	2	C822 5910-	CAPACITOR	72982	same as 55 535-17	Ref
67	2	C825 5910-	CAPACITOR	72982	same as 55 535-17	Ref
68	2	C826 5910-	CAPACITOR	72982	same as 55 535-17	Ref
69	2	C829 5910-	CAPACITOR	72982	same as 55 535-17	Ref
70	2	C830 5910-	CAPACITOR	72982	same as 55 535-17	Ref
71	2	C833 5910-	CAPACITOR	72982	same as 55 535-17	Ref
72	2	C834 5910-	CAPACITOR	72982	same as 55 535-17	Ref
73	2	C836 5910-	CAPACITOR	72982	same as 55 535-17	Ref
74	2	C837 5910-	CAPACITOR	72982	same as 55 535-17	Ref
75	2	C840 5910-	CAPACITOR	72982	same as 55 535-17	Ref
76	2	C841 5910-	CAPACITOR	72982	same as 55 535-17	Ref
77	2	C844 5910-	CAPACITOR	72982	same as 55 535-17	Ref
78	2	C845 5910-	CAPACITOR	72982	same as 55 535-17	Ref
79	2	C848 5910-	CAPACITOR	72982	same as 55 535-17	Ref
80	2	C849 5910-	CAPACITOR	72982	same as 55 535-17	Ref
81	2	C853 5910-	CAPACITOR	72982	same as 55 535-17	Ref
82	2	C854 5910-	CAPACITOR	72982	same as 55 535-17	Ref
83	2	C857 5910-	CAPACITOR	72982	SAME as 55 535-17	Ref
84	2	C858 5910-	CAPACITOR	72982	same as 55 535-17	Ref
85	2	C861 5910-	CAPACITOR	72982	same as 55 535-17	Ref

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
86	2	C862 5910-	CAPACITOR	72982	same as 55 535-17	Ref
87	2	C867 5910-	CAPACITOR	72982	same as 55 535-17	Ref
88	2	C877 5910-	CAPACITOR	72982	same as 55 535-17	Ref
89	2	L803 5950-	COIL, RF	28569	3320-144	8
90	2	L804 5950-	COIL, RF	28569	same as 89 3320-144	Ref
91	2	L805 5950-	COIL, RF	28569	same as 89 3320-144	Ref
92	2	L806 5950-	COIL, RF	28569	same as 89 3320-144	Ref
93	2	L811 5950-	COIL, RF	28569	same as 89 3320-144	Ref
94	2	L812 5950-	COIL, RF	28569	same as 89 3320-144	Ref
95	2	L813 5950-	COIL, RF	28569	same as 89 3320-144	Ref
96	2	L814 5950-	COIL, RF	28569	same as 89 3320-144	Ref
97	2	L819 5950-	COIL, RF	28569	3320-146	2
98	2	L820 5950-	COIL, RF	28569	same as 97 3320-146	Ref
99	2	L801 5950-	COIL, RF	28569	3320-149	4
100	2	L802 5950-	COIL, RF	28569	same as 99 3320-149	Ref
101	2	L809 5950-	COIL, RF	28569	same as 99 3320-149	Ref
102	2	L810 5950-	COIL, RF	28569	same as 99 3320-149	Ref
103	2	L807 5950-	COIL, RF	28569	3320-151	4
104	2	L808 5950-	COIL, RF	28569	same as 103 3320-151	Ref
105	2	L815 5950-	COIL, RF	28569	same as 103 3320-151	Ref
106	2	L816 5950-	COIL, RF	28569	same as 103 3320-151	Ref
107	2	L817 5950-	COIL, RF	28569	3320-156	2

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME	PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO. / FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
108	2	L818 5950-	COIL, RF 28569	Same as 107 3320-156	Ref
109	2	J801 5935-241-0342	CONNECTOR 02660	3475-84 83-798	2
110	2	J802 5935-241-0342	CONNECTOR 02660	Same as 109 83-798	Ref
111	2	J803 5935-259-3606	CONNECTOR 02660	16525-162 26-159-16	1
112	2	V802 5960-	ELECTRON TUBE 86684	20875-51 6AL5	1
113	2	V801 5960-	ELECTRON TUBE 86684	20875-77 12AT7	4
114	2	V803 5960-	ELECTRON TUBE 86684	Same as 113 12AT7	Ref
115	2	V804 5960-	ELECTRON TUBE 86684	Same as 113 12AT7	Ref
116	2	V815 5960-	ELECTRON TUBE 86684	Same as 113 12AT7	Ref
117	2	V808 5960-	ELEC TBS, MTCHD 28569	20877-12	2 pr
118	2	V809 5960-	ELEC TBS, MTCHD 28569	Same as 117 20877-12	Ref
119	2	V813 5960-	ELEC TBS, MTCHD 28569	Same as 117 20877-12	Ref
120	2	V814 5960-	ELEC TBS, MTCHD 28569	Same as 117 20877-12	Ref
121	2	V806 5960-	ELEC TBS, MTCHD 28569	20877-13	2 pr.
122	2	V807 5960-	ELEC TBS, MTCHD 28569	Same as 121 20877-13	Ref
123	2	V811 5960-	ELEC TBS, MTCHD 28569	Same as 121 20877-13	Ref
124	2	V812 5960-	ELEC TBS, MTCHD 28569	Same as 121 20877-13	Ref
125	2	V805 5960-	ELEC TBS, MTCHD 28569	20877-14	1 pr.
126	2	V810 5960-	ELEC TBS, MTCHD 28569	Same as 125 20877-14	Ref
127	2	H168 5355-	KNOB 28569	11505-86	2
128	2	H169 5355-	KNOB 28569	Same as 127 11505-86	Ref

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
129	2	H170 5355-	KNOB	28569	11505-87	3
130	2	H171 5355-	KNOB	28569	Same as 129 11505-87	Ref
131	2	H172 5355-	KNOB	28569	Same as 129 11505-87	Ref
132	2	H173 5355-	KNOB	28569	11505-89	1
133	2	H174 5355-	KNOB	28569	11505-90	2
134	2	H175 5355-	KNOB	28569	same as 133 11505-90	Ref
135	2	H176 5355-	KNOB	28569	11505-94	2
136	2	H177 5355-	KNOB	28569	same as 135 11505-94	Ref
137	2	H180 5310-	NUT, PLAIN, HEX	28569	2900-48	1
138	2	E801 5940-	POST, BINDING	28569	2360-86	2
139	2	E802 5940-	POST, BINDING	28569	same as 138 2360-86	Ref
140	2	R815 5905-	RESISTOR, COMP	81349	X18410-102 RC20GF100K	6
141	2	R818 5905-	RESISTOR, COMP	81349	same as 140 RC20GF100K	Ref
142	2	R821 5905-	RESISTOR, COMP	81349	same as 140 RC20GF100K	Ref
143	2	R836 5905-	RESISTOR, COMP	81349	same as 140 RC20GF100K	Ref
144	2	R839 5905-	RESISTOR, COMP	81349	same as 140 RC20GF100K	Ref
145	2	R842 5905-	RESISTOR, COMP	81349	same as 140 RC20GF100K	Ref
146	2	R847 5905	RESISTOR, COMP	81349	X18410-272 RC20GF270K	4
147	2	R868 5905-	RESISTOR, COMP	81349	same as 146 RC20GF270K	Ref
148	2	R916 5905-	RESISTOR, COMP	81349	same as 146 RC20GF270K	Ref
149	2	R918 5905-	RESISTOR, COMP	81349	same as 146 RC20GF270K	Ref
150	2	R802 5905-	RESISTOR, COMP	81349	X18410-472 RC20GF470K	8

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
151	2	R823 5905-	RESISTOR, COMP	81349	same as 150 RC20GF470K	Ref
152	2	R845 5905-	RESISTOR, COMP	81349	same as 150 RC20GF470K	Ref
153	2	R859 5905-	RESISTOR, COMP	81349	same as 150 RC20GF470K	Ref
154	2	R863 5905-	RESISTOR, COMP	81349	same as 150 RC20GF470K	Ref
155	2	R866 5905-	RESISTOR, COMP	81349	same as 150 RC20GF470K	Ref
156	2	R880 5905-	RESISTOR, COMP	81349	same as 150 RC20GF470K	Ref
157	2	R884 5905-	RESISTOR, COMP	81349	same as 150 RC20GF470K	Ref
158	2	R801 5905-	RESISTOR, COMP	81349	X18410-332 RC20GF330K	2
159	2	R822 5905-	RESISTOR, COMP	81349	same as 158 RC20GF330K	Ref
160	2	R891 5905-	RESISTOR, COMP	81349	X18411-102 RC20GF101K	4
161	2	R892 5905-	RESISTOR, COMP	81349	same as 160 RC20GF101K	Ref
162	2	R900 5905-	RESISTOR, COMP	81349	same as 160 RC20GF101K	Ref
163	2	R901 5905-	RESISTOR, COMP	81349	same as 160 RC20GF101K	Ref
164	2	R848 5905-192-3973	RESISTOR, COMP	81349	X18411-471 RC20GF471J	4
165	2	R858 5905-192-3973	RESISTOR, COMP	81349	same as 164 RC20GF471J	Ref
166	2	R869 5905-192-3973	RESISTOR, COMP	81349	same as 164 RC20GF471J	Ref
167	2	R879 5905-192-3973	RESISTOR, COMP	81349	same as 164 RC20GF471J	Ref
168	2	R895 5905-	RESISTOR, COMP	81349	X18411-472 RC20GF471K	2
169	2	R896 5905-	RESISTOR, COMP	81349	same as 168 RC20GF471K	Ref
170	2	R857 5905-	RESISTOR, COMP	81349	X18411-562 RC20GF561K	2
171	2	R878 5905-	RESISTOR, COMP	81349	same as 170 RC20GF561K	Ref
172	2	R897 5905-	RESISTOR, COMP	81349	X18412-472 RC20GF472K	2

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
173	2	R899 5905-	RESISTOR, COMP	81349	same as 172 RC20GF472K	Ref
174	2	R855 5905-	RESISTOR, COMP	81349	X18414-102 RC20GF104K	8
175	2	R860 5905-	RESISTOR, COMP	81349	same as 174 RC20GF104K	Ref
176	2	R862 5905-	RESISTOR, COMP	81349	same as 174 RC20GF104K	Ref
177	2	R877 5905-	RESISTOR, COMP	81349	same as 174 RC20GF104K	Ref
178	2	R881 5905-	RESISTOR, COMP	81349	same as 174 RC20GF104K	Ref
179	2	R883 5905-	RESISTOR, COMP	81349	same as 174 RC20GF104K	Ref
180	2	R906 5905-	RESISTOR, COMP	81349	same as 174 RC20GF104K	Ref
181	2	R907 5905-	RESISTOR, COMP	81349	same as 174 RC20GF104K	Ref
182	2	R889 5905-279-1871	RESISTOR, COMP	81349	X18414-161 RC20GF164J	2
183	2	R890 5905-279-1871	RESISTOR, COMP	81349	same as 182 RC20GF164J	Ref
184	2	R893 5905-171-2003	RESISTOR, COMP	81349	X18414-201 RC20GF204J	2
185	2	R894 5905-171-2003	RESISTOR, COMP	81349	same as 184 RC20GF204J	Ref
186	2	R887 5905-	RESISTOR, COMP	81349	X18414-222 RC20GF224K	2
187	2	R888 5905-	RESISTOR, COMP	81349	same as 186 RC20GF224K	Ref
188	2	R844 5905-	RESISTOR, COMP	81349	X18415-102 RC20GF105K	2
189	2	R865 5905-	RESISTOR, COMP	81349	same as 188 RC20GF105K	Ref
190	2	R849 5905-279-2650	RESISTOR, COMP	81349	X18422-561 RC32GF562J	4
191	2	R850 5905-279-2650	RESISTOR, COMP	81349	same as 190 RC32GF562J	Ref
192	2	R870 5905-279-2650	RESISTOR, COMP	81349	same as 190 RC32GF562J	Ref
193	2	R871 5905-279-2650	RESISTOR, COMP	81349	same as 190 RC32GF562J	Ref
194	2	R911 5905-	RESISTOR, COMP	81349	X18422-182 RC32GF182K	1

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
195	2	R905 5905-	RESISTOR, COMP	81349	X18422-562 RC32GF562K	1
196	2	R912 5905-279-1718	RESISTOR, COMP	81349	X18422-821 RC32GF822J	4
197	2	R913 5905-279-1718	RESISTOR, COMP	81349	same as 196 RC32GF822J	Ref
198	2	R914 5905-279-1718	RESISTOR, COMP	81349	same as 196 RC32GF822J	Ref
199	2	R915 5905-279-1718	RESISTOR, COMP	81349	same as 196 RC32GF822J	Ref
200	2	R856 5905-	RESISTOR, COMP	81349	X18423-222 RC32GF223K	2
201	2	R876 5905-	RESISTOR, COMP	81349	same as 200 RC32GF223K	Ref
202	2	R898 5905-	RESISTOR, COMP	81349	X18423-682 RC32GF683K	1
203	2	R904 5905-	RESISTOR, COMP	81349	X18432-562 RC42GF562K	1
204	2	R846 5905-	RESISTOR, COMP	81349	X18433-222 RC42GF223K	2
205	2	R867 5905-	RESISTOR, COMP	81349	same as 204 RC42GF223K	Ref
206	2	R885 5905-	RESISTOR, COMP	81349	X18433-332 RC42GF333K	2
207	2	R886 5905-	RESISTOR, COMP	81349	same as 206 RC42GF333K	Ref
208	2	R807 5905-	RESISTOR, FILM	19701	18530-4 DC1-2A900K OHMS	2
209	2	R828 5905-	RESISTOR, FILM	19701	same as 208 DC1-2A900K OHMS	Ref
210	2	R803 5905-	RESISTOR, FILM	19701	18530-23 DC1-2A500K OHMS	2
211	2	R824 5905-	RESISTOR, FILM	19701	same as 210 DC1-2A500K OHMS	Ref
212	2	R812 5905-	RESISTOR, FILM	19701	18530-79 DC1-2A25.6K OHMS	2
213	2	R833 5905-	RESISTOR, FILM	19701	same as 212 DC1-2A25.6K OHMS	Ref
214	2	R814 5905-	RESISTOR, FILM	19701	18530-81 DC1-2A10.1K OHMS	2
215	2	R835 5905-	RESISTOR, FILM	19701	same as 214 DC1-2A10.1K OHMS	Ref

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
216	2	R817 5905-	RESISTOR, FILM	19701	18530-83 DC1-2A5030 OHMS	2
217	2	R838 5905-	RESISTOR, FILM	19701	same as 216 DC1-2A5030 OHMS	Ref
218	2	R820 5905-	RESISTOR, FILM	19701	18530-85 DC1-2A2510 OHMS	2
219	2	R841 5905-	RESISTOR, FILM	19701	same as 218 DC1-2A2510 OHMS	Ref
220	2	R810 5905-	RESISTOR, FILM	19701	18530-87 DC1-2A52.6KOHMS	2
221	2	R831 5905-	RESISTOR, FILM	19701	same as 220 DC1-2A52.6K OHMS	Ref
222	2	R808 5905-	RESISTOR, FILM	19701	18530-89 DC1-2A111K OHMS	2
223	2	R829 5905-	RESISTOR, FILM	19701	same as 222 DC1-2A111K OHMS	Ref
224	2	R806 5905-	RESISTOR, FILM	19701	18530-91 DC1-2A333K OHMS	2
225	2	R827 5905-	RESISTOR, FILM	19701	same as 224 DC1-2A333K OHMS	Ref
226	2	R805 5905-	RESISTOR, FILM	19701	18530-92 DC1-2A750K OHMS	2
227	2	R826 5905-	RESISTOR, FILM	19701	same as 226 DC1-2A750K OHMS	Ref
228	2	R809 5905-	RESISTOR, FILM	19701	18530-93 DC1-2A950K OHMS	2
229	2	R830 5905-	RESISTOR, FILM	19701	same as 228 DC1-2A950K OHMS	Ref
230	2	R811 5905-	RESISTOR, FILM	19701	18530-94 DC1-2A975K OHMS	2
231	2	R832 5905-	RESISTOR, FILM	19701	same as 230 DC-1-2A975K OHMS	Ref
232	2	R804 5905-	RESISTOR, FILM	19701	18530-95 DC1-2A1 Meg	4
233	2	R825 5905-	RESISTOR, FILM	19701	same as 232 DC1-2A1 MEG	Ref
234	2	R843 5905-	RESISTOR, FILM	19701	same as 232 DC1-2A1 MEG	Ref
235	2	R864 5905-	RESISTOR, FILM	19701	same as 232 DC1-2A1 MEG	Ref
236	2	R813 5905-	RESISTOR, FILM	19701	18530-96 DC1-2A990K OHMS	2
237	2	R834 5905-	RESISTOR, FILM	19701	same as 236 DC1-2A990K OHMS	Ref

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME	PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO. / FED. MFR. CODE	MANUFACTURERS PART NUMBER	USABLE ON CODE
238	2	R816 5905-	RESISTOR, FILM 19701	18530-98 DC1-2A995K OHMS	2
239	2	R837 5905-	RESISTOR, FILM 19701	same as 238 DC1-2A995K OHMS	Ref
240	2	R819 5905-	RESISTOR, FILM 19701	18530-99 DC1-2A997K OHMS	2
241	2	R840 5905-	RESISTOR, FILM 19701	same as 240 DC1-2A997K OHMS	Ref
242	2	R902 5905-	RESISTOR, WW 63743	18575-223 5X6000	2
243	2	R903 5905-	RESISTOR, WW 63743	same as 242 5X6000	Ref
244	2	R852 5905-	RESISTOR, WW 63743	18575-224 5X8000	2
245	2	R873 5905-	RESISTOR, WW 63743	same as 244 5X8000	Ref
246	2	R917 5905-279-7309	RESISTOR, WW 63743	18575-228 5X3000	1
247	2	R909 5905-	RESISTOR, WW 28569	18575-158	2
248	2	R910 5905-	RESISTOR, WW 28569	same as 247 18575-158	Ref
249	2	R861 5905-	RESISTOR, VAR 28569	16925-341	2
250	2	R882 5905-	RESISTOR, VAR 28569	same as 249 16925-341	Ref
251	2	R908 5905-	RESISTOR, VAR 28569	16925-342	1
252	2	R851 5905-	RESISTOR, VAR 28569	16925-353	2
253	2	R872 5905-	RESISTOR, VAR 28569	same as 252 16925-353	Ref
254	2	R853 5905-	RESISTOR, VAR 28569	16925-353	2
255	2	R874 5905-	RESISTOR, VAR 28569	same as 254 16925-353	Ref
256	2	R854 5905-	RESISTOR, VAR 81349	40101-253 RV4NAYSD253B	2
257	2	R875 5905-	RESISTOR, VAR 81349	same as 256 RV4NAYSD253B	Ref
258	2	H122 5340-	RING, RETAINER 97464	18700-14 1000-18-SS	1
259	2	H127	SHAFT, LOCKING 28569	19100-113	1

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
260	2	H147	SHAFT, EXT, POT	28569	19100-116	2
261	2	XV801 5935-	SOCKET, TUBE	71785	19350-298 44F16388	4
262	2	XV803 5935-	SOCKET, TUBE	71785	same as 261 44F16388	Ref
263	2	XV804 5935-	SOCKET, TUBE	71785	same as 261 44F16388	Ref
264	2	XV815 5935-	SOCKET, TUBE	71785	Same as 261 44F16388	Ref
265	2	XV802 5935-	SOCKET, TUBE	71785	19350-299 53C17004	3
266	2	XV805 5935-	SOCKET, TUBE	71785	same as 265 53C17004	Ref
267	2	XV810 5935-	SOCKET, TUBE	71785	same as 265 53C17004	Ref
268	2	XV806 5935-	SOCKET, TUBE	71785	19350-300 53C13256	8
269	2	XV807 5935-	SOCKET, TUBE	71785	same as 268 53C13256	Ref
270	2	XV808 5935-	SOCKET, TUBE	71785	same as 268 53C13256	Ref
271	2	XV809 5935-	SOCKET, TUBE	71785	same as 268 53C13256	Ref
272	2	XV811 5935-	SOCKET, TUBE	71785	same as 268 53C13256	Ref
273	2	XV812 5935-	SOCKET, TUBE	71785	same as 268 53C13256	Ref
274	2	XV813 5935-	SOCKET, TUBE	71785	same as 268 53C13256	Ref
275	2	XV814 5935-	SOCKET, TUBE	71785	same as 268 53C13256	Ref
276	2	S801 5930-	SWITCH, ROTARY	28569	19912-390	2
277	2	S805 5930-	SWITCH, ROTARY	28569	same as 276 19912-390	Ref
278	2	S803 5930-	SWITCH, ROTARY	28569	19912-391	2
279	2	S807 5930-	SWITCH, ROTARY	28569	same as 278 19912-391	Ref
280	2	S804 5930-	SWITCH, ROTARY	28569	19912-392	1
281	2	S802 5930-509-9866	SWITCH, SLIDE	78488	19911-68 SS-2	2

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME	PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO. / FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
282	2	S806 5930-509-9866	SWITCH, SLIDE 78488	same as 281 SS-2	Ref
283	2	E813 5940-	TERMINAL STRIP 28569	20352-1	1
284	2	E807 5940-	TERMINAL STRIP 28569	20352-109	2
285	2	E808 5940-	TERMINAL STRIP 28569	same as 284 20352-109	Ref
286	2	E809 5940-	TERMINAL STRIP 28569	20352-204	2
287	2	E810 5940-	TERMINAL STRIP 28569	same as 286 20352-204	Ref
288	2	E811 5940-	TERMINAL STRIP 28569	20352-211	2
289	2	E812 5940-	TERMINAL STRIP 28569	same as 288 20352-211	Ref
290	2	E803 5940-	TERMINAL STRIP 28569	20352-305	4
291	2	E804 5940-	TERMINAL STRIP 28569	same as 290 20352-305	Ref
292	2	E805 5940-	TERMINAL STRIP 28569	same as 290 20352-305	Ref
293	2	E806 5940-	TERMINAL STRIP 28569	same as 290 20352-305	Ref

PRELIMINARY PARTS LIST

PREAMPLIFIER, MODEL NO. 1824

ITEM OR SEQNCE NO.	INDENT.	REFERENCE SYMBOL NO. (FOR ELECTRONICS ONLY) OPTIONAL FOR OTHER	ITEM NAME		PRIME CONTRACTOR'S PART NUMBER	QTY. END ART.
SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
1	1		PREAMPLIFIER	28569	902-336	
2	2	H1101	BRACKET, ANGLE	28569	2660-830	1
3	2	H1102 4730-	BUSHING, THD	28569	2900-55	1
4	2	C1109 5910-538-7424	CAPACITOR	81349	X3110-64 CK63Y103Z	3
5	2	C1112 5910-538-7424	CAPACITOR	81349	Same as 4 CK63Y103Z	Ref
6	2	C115 5910-538-7424	CAPACITOR	81349	Same as 4 CK63Y103Z	Ref
7	2	C1108 5910-	CAPACITOR	72982	3110-103 NP0A2.2 ± .5 uuf	1
8	2	C1110 5910-	CAPACITOR	72982	3110-107 Z5U0102P	2
9	2	C1111 5910-	CAPACITOR	72982	Same as 8 Z5U0102P	Ref
10	2	C1123 5910-	CAPACITOR	81349	X3095-55 CM20C331K	2
11	2	C1124 5910-	CAPACITOR	81349	Same as 10 CM20C331K	Ref
12	2	C1129 5910-101-5783	CAPACITOR	81349	X3095-118 CM30E202J	2
13	2	C1130 5910-101-5783	CAPACITOR	81349	Same as 12 CM30E202J	Ref
14	2	C1101 5910-	CAPACITOR	28569	3105-268	1 pr.
15	2	C1102 5910-	CAPACITOR	28569	Same as 14 3105-268	Ref.
16	2	C1105 5910-	CAPACITOR	72982	3115-16 503-27NP01.5-7 uuf	9
17	2	C1106 5910-	CAPACITOR	72982	Same as 16 503-27NP01.5-7 uuf	Ref
18	2	C1107 5910-	CAPACITOR	72982	Same as 16 503-27NP01.5-7 uuf	Ref
19	2	C1118 5910-	CAPACITOR	72982	Same as 16 503-27NP01.5-7 uuf	Ref
20	2	C1119 5910-	CAPACITOR	72982	Same as 16 503-27NP01.5-7 uuf	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
21	2	C1122 5910-	CAPACITOR	72982	Same as 16 503-27NP01.5-7 uuf	Ref
22	2	C1125 5910-	CAPACITOR	72982	Same as 16 503-27NP01.5-7 uuf	Ref
23	2	C1128 5910-	CAPACITOR	72982	Same as 16 503-27NP01.5-7 uuf	Ref
24	2	C1131 5910-	CAPACITOR	72982	Same as 16 503-27NP01.5-7 uuf	Ref
25	2	C1103 5910-	CAPACITOR	72982	3115-20 503-27NP04.5-25 uuf	2
26	2	C1104 5910-	CAPACITOR	72982	Same as 25 503-27NP04.5-25 uuf	Ref
27	2	C1116 5910-	CAPACITOR	72982	3115-21 503-27N500 7-45 uuf	6
28	2	C1117 5910-	CAPACITOR	72982	Same as 27 503-27N500 7-45 uuf	Ref
29	2	C1120 5910-	CAPACITOR	72982	Same as 27 503-27N500 7-45 uuf	Ref
30	2	C1121 5910-	CAPACITOR	72982	Same as 27 503-27N500 7-45 uuf	Ref
31	2	C1126 5910-	CAPACITOR	72982	Same as 27 503-27N500 7-45 uuf	Ref
32	2	C1127 5910-	CAPACITOR	72982	Same as 27 503-27N500 7-45 uuf	Ref
33	2	C1113 5910-	CAPACITOR	72982	3115-22 557-06N750 8-50 uuf	2
34	2	C1114 5910-	CAPACITOR	72982	Same as 33 557-06N750 8-50 uuf	Ref
35	2	H1103 5340-	CLAMP, LOOP	83330	3275-272 839	2
36	2	L1101 5950-	COIL, RF	28569	3320-170	2
37	2	L1102 5950-	COIL, RF	28569	Same as 36 3320-170	Ref
38	2	J1101 5935-259-0148	CONNECTOR	02660	3475-12 83-1R	2
39	2	J1102 5935-259-0148	CONNECTOR	02660	Same as 38 83-1R	Ref
40	2	J1103 5935-259-3606	CONNECTOR	02660	16525-162 26-159-16	1
41	2	V1103 5960-166-7663	ELECTRON TUBE	81349	X20875-69 12AU7	2
42	2	V1106 5960-166-7663	ELECTRON TUBE	81349	Same as 41 12AU7	Ref

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43	2	V1101 5960-	ELEC TBS, MTCHD	28569	20877-16	1 pr
44	2	V1102 5960-	ELEC TBS, MTCHD	28569	Same as 43 20877-16	Ref
45	2	V1104 5960-	ELEC TBS, MTCHD	28569	20877-17	1 pr
46	2	V1105 5960-	ELEC TBS, MTCHD	28569	Same as 45 20877-17	Ref
47	2	H1104 5355-	KNOB	28569	11505-87	1
48	2	H1105 5355-	KNOB	28569	11505-89	1
49	2	H1106 5355-	KNOB	28569	11505-90	2
50	2	H1107 5355-	KNOB	28569	11505-91	2
51	2	H1108 5355-	KNOB	28569	11505-94	2
52	2	E1101 5940-	POST, BINDING	28569	2360-86	2
53	2	E1102 5940-	POST, BINDING	28569	Same as 52 2360-86	Ref
54	2	R1105 5905-	RESISTOR, COMP	81349	X18410-472 RC20GF470K	2
55	2	R1106 5905-	RESISTOR, COMP	81349	Same as 54 RC20GF470K	Ref
56	2	R1101 5905-279-3513	RESISTOR, COMP	81349	X18411-221 RC20GF221J	2
57	2	R1102 5905-279-3513	RESISTOR, COMP	81349	Same as 56 RC20GF221J	Ref
58	2	R1138 5905-	RESISTOR, COMP	81349	X18412-682 RC20GF682K	1
59	2	R1116 5905-	RESISTOR, COMP	81349	X18412-822 RC20GF822K	6
60	2	R1117 5905-	RESISTOR, COMP	81349	Same as 59 RC20GF822K	Ref
61	2	R1118 5905-	RESISTOR, COMP	81349	Same as 59 RC20GF822K	Ref
62	2	R1119 5905-	RESISTOR, COMP	81349	Same as 59 RC20GF822K	Ref
63	2	R1120 5905-	RESISTOR, COMP	81349	Same as 59 RC20GF822K	Ref
64	2	R1121 5905-	RESISTOR, COMP	81349	Same as 59 RC20GF822K	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
65	2	R1149 5905-	RESISTOR,	COMP 81349	X18422-822 RC32GF822K	2
66	2	R1151 5905-	RESISTOR,	COMP 81349	Same as 65 RC32GF822K	Ref
67	2	R1131 5905-	RESISTOR,	COMP 81349	X18423-392 RC32GF393K	2
68	2	R1132 5905-	RESISTOR,	COMP 81349	Same as 67 RC32GF393K	Ref
69	2	R1115 5905-	RESISTOR,	COMP 81349	X18424-562 RC32GF564K	1
70	2	R1142 5905-	RESISTOR,	COMP 81349	X18424-822 RC32GF824K	1
71	2	R1125 5905-	RESISTOR,	COMP 81349	X18425-122 RC32GF125K	1
72	2	R1163 5905-	RESISTOR,	FILM 19701	18530-4 DC1-2A900K OHMS	2
73	2	R1157 5905-	RESISTOR,	FILM 19701	Same as 72 DC1-2A900K OHMS	Ref
74	2	R1108 5905-	RESISTOR,	FILM 19701	18530-19 DC1-2A120K OHMS	1
75	2	R1167 5905-	RESISTOR,	FILM 19701	18530-55 DC1-2A5000 OHMS	2
76	2	R1169 5905-	RESISTOR,	FILM 19701	Same as 75 DC1-2A5000 OHMS	Ref
77	2	R1154 5905-	RESISTOR,	FILM 19701	18530-69 DC1-2A106K OHMS	2
78	2	R1156 5905-	RESISTOR,	FILM 19701	Same as 77 DC1-2A106K OHMS	Ref
79	2	R1104 5905-	RESISTOR,	FILM 81349	X18530-95 RN20X1004F	4
80	2	R1108 5905-	RESISTOR,	FILM 81349	Same as 79 RN20X1004F	Ref
81	2	R1163 5905-	RESISTOR,	FILM 81349	Same as 79 RN20X1004F	Ref
82	2	R1166 5905-	RESISTOR,	FILM 81349	Same as 79 RN20X1004F	Ref
83	2	R1158 5905-	RESISTOR,	FILM 19701	18530-96 DC1-2A990K OHMS	2
84	2	R1162 5905-	RESISTOR,	FILM 19701	Same as 83 DC1-2A990K OHMS	Ref
85	2	R1129 5905-	RESISTOR,	FILM 19701	18530-123 DC1-2A180000 OHMS	2
86	2	R1134 5905-	RESISTOR,	FILM 19701	Same as 85 DC1-2A180000 OHMS	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
87	2	R1141 5905-	RESISTOR, FILM	19701	18530-124 DC1-2A7300 OHMS	1
88	2	R1140 5905-	RESISTOR, FILM	19701	18530-125 DC1-2A29200 OHMS	1
89	2	R1122 5905-	RESISTOR, FILM	19701	18530-126 DC1-2A38000 OHMS	1
90	2	R1128 5905-	RESISTOR, FILM	19701	18530-127 DC1-2A183K OHMS	1
91	2	R1123 5905-	RESISTOR, FILM	81349	X18530-128 RN20X1272F	1
92	2	R1124 5905-	RESISTOR, FILM	19701	18530-129 DC1-2A4230 OHMS	1
93	2	R1159 5905-	RESISTOR, FILM	19701	18530-130 DC1-2A9850 OHMS	2
94	2	R1161 5905-	RESISTOR, FILM	19701	Same as 93 DC1-2A9850 OHMS	Ref
95	2	R1127 5905-	RESISTOR, FILM	19701	18530-131 DC1-2A31100 OHMS	1
96	2	R1135 5905-	RESISTOR, FILM	19701	18530-132 DC1-2A82000 OHMS	2
97	2	R1136 5905-	RESISTOR, FILM	19701	Same as 96 DC1-2A82000 OHMS	Ref
98	2	R1164 5905-	RESISTOR, FILM	19701	18530-133 DC1-2A1190 OHMS	2
99	2	R1165 5905-	RESISTOR, FILM	19701	Same as 98 DC1-2A1190 OHMS	Ref
100	2	R1144 5905-	RESISTOR, FILM	19701	18531-2 DC1-50000 OHMS	2
101	2	R1148 5905-	RESISTOR, FILM	19701	Same as 100 DC1-50000 OHMS	Ref
102	2	R1145 5905-	RESISTOR, FILM	81349	X18531-13 RN25X1433F	2
103	2	R1147 5905-	RESISTOR, FILM	81349	Same as 102 RN25X1433F	Ref
104	2	R1152 5905-	RESISTOR, WW	63743	18575-241 Z84WL	1
105	2	R1110 5905-	RESISTOR, WW	63743	18575-246 5F10000	4
106	2	R1112 5905-	RESISTOR, WW	63743	Same as 105 5F10000	Ref
107	2	R1113 5905-	RESISTOR, WW	63743	Same as 105 5F10000	Ref
108	2	R1114 5905-	RESISTOR, WW	63743	Same as 105 5F10000	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO.	FED. MFR. CODE	MANUFACTURERS PART NUMBER	US-ABLE ON CODE
109	2	R1107 5905-	RESISTOR, WW	28569	18577-174	2
110	2	R1109 5905-	RESISTOR, WW	28569	Same as 109 18577-174	Ref
111	2	R1160 5905-	RESISTOR, VAR	71590	16925-349 A135-500	1
112	2	R1130 5905-	RESISTOR, VAR	71590	16925-350 A012-2500	2
113	2	R1168 5905-	RESISTOR VAR	71590	Same as 112 A012-2500	Ref
114	2	R1155 5905-	RESISTOR, VAR	71590	16925-360 311-017-10K	1
115	2	R1111 5905-	RESISTOR, VAR	81349	X40101-102 RV4NAYSD102B	1
116	2	R1143 5905-	RESISTOR, VAR	81349	X40101-105 RV4NAYSD105B	1
117	2	R1133 5905-	RESISTOR, VAR	81349	X40101-502 RV4NAYSD502B	4
118	2	R1137 5905-	RESISTOR, VAR	81349	Same as 117 RV4NAYSD502B	Ref
119	2	R1146 5905-	RESISTOR, VAR	81349	Same as 117 RV4NAYSD502B	Ref
120	2	R1150 5905-	RESISTOR, VAR	81349	Same as 117 RV4NAYSD502B	Ref
121	2	R1126 5905-	RESISTOR, VAR	81349	X40101-504 RV4NAYSD504B	1
122	2	H1109 5960	RETAINER, SHLD	71785	2175-88 20K14651	1
123	2	H1110 5340-	RING, RETAINING	97464	18700-14 1000-18-SS	1
124	2	H1111	SHAFT, EXT	28569	19100-122	1
125	2	H1112	SHAFT, EXT	28569	19100-123	1
126	2	H1113	SHAFT, LOCKING	28569	19100-113	1
127	2	E1101 5960-264-3004	SHIELD, TUBE	81350	X19155-140 TS103U02	1
128	2	XV1101 5935-581-7061	SOCKET, TUBE	71785	19350-298 44F16388	6
129	2	XV1102 5935-581-7061	SOCKET, TUBE	71785	Same as 128 44F16388	Ref
130	2	XV1103 5935-581-7061	SOCKET, TUBE	71785	Same as 128 44F16388	Ref

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SMR CODE		STOCK NUMBER	ITEM AND LOT NO. / FED. MFR. CODE	MANUFACTURERS PART NUMBER	USABLE ON CODE
131	2	XV1104 5935-581-7061	SOCKET, TUBE 71785	Same as 128 44F16388	Ref
132	2	XV1105 5935-581-7061	SOCKET, TUBE 71785	Same as 128 44F16388	Ref
133	2	XV1106 5935-581-7061	SOCKET, TUBE 71785	Same as 128 44F16388	Ref
134	2	S1102 5930-	SWITCH, ROTARY 28569	19912-407	1
135	2	S1104 5930-	SWITCH, ROTARY 28569	19912-408	1
136	2	S1103 5930-	SWITCH, ROTARY 28569	19912-409	1
137	2	E1150 5940-	TERMINAL STRIP 28569	20352-7	5
138	2	E1151 5940-	TERMINAL STRIP 28569	Same as 137 20352-7	Ref
139	2	E1152 5940-	TERMINAL STRIP 28569	Same as 137 20352-7	Ref
140	2	E1153 5940-	TERMINAL STRIP 28569	Same as 137 20352-7	Ref
141	2	E1154 5940-	TERMINAL STRIP 28569	Same as 137 20352-7	Ref
142	2	E1155 5940-	TERMINAL STRIP 28569	20352-201	1
143	2	E1156 5940-	TERMINAL STRIP 28569	20352-202	1
144	2	E1157 5940-	TERMINAL STRIP 28569	20352-204	1
145	2	E1158 5940-	TERMINAL STRIP 28569	20352-401	1